



THE OHIO STATE UNIVERSITY



BULLETIN

GRADUATE SCHOOL

ISSUE FOR 1954 - 1955 SESSIONS

PUBLISHED BY THE UNIVERSITY AT COLUMBUS

Entered as second-class matter November 17, 1905, at the postoffice at Columbus, Ohio, under the Act of March 3, 1879. Acceptance for mailing at special rate of postage provided for in Section 1103, Act of October 3, 1917. Authorized July 10, 1918.

VOLUME LVIII

JULY 20, 1954

NUMBER 25

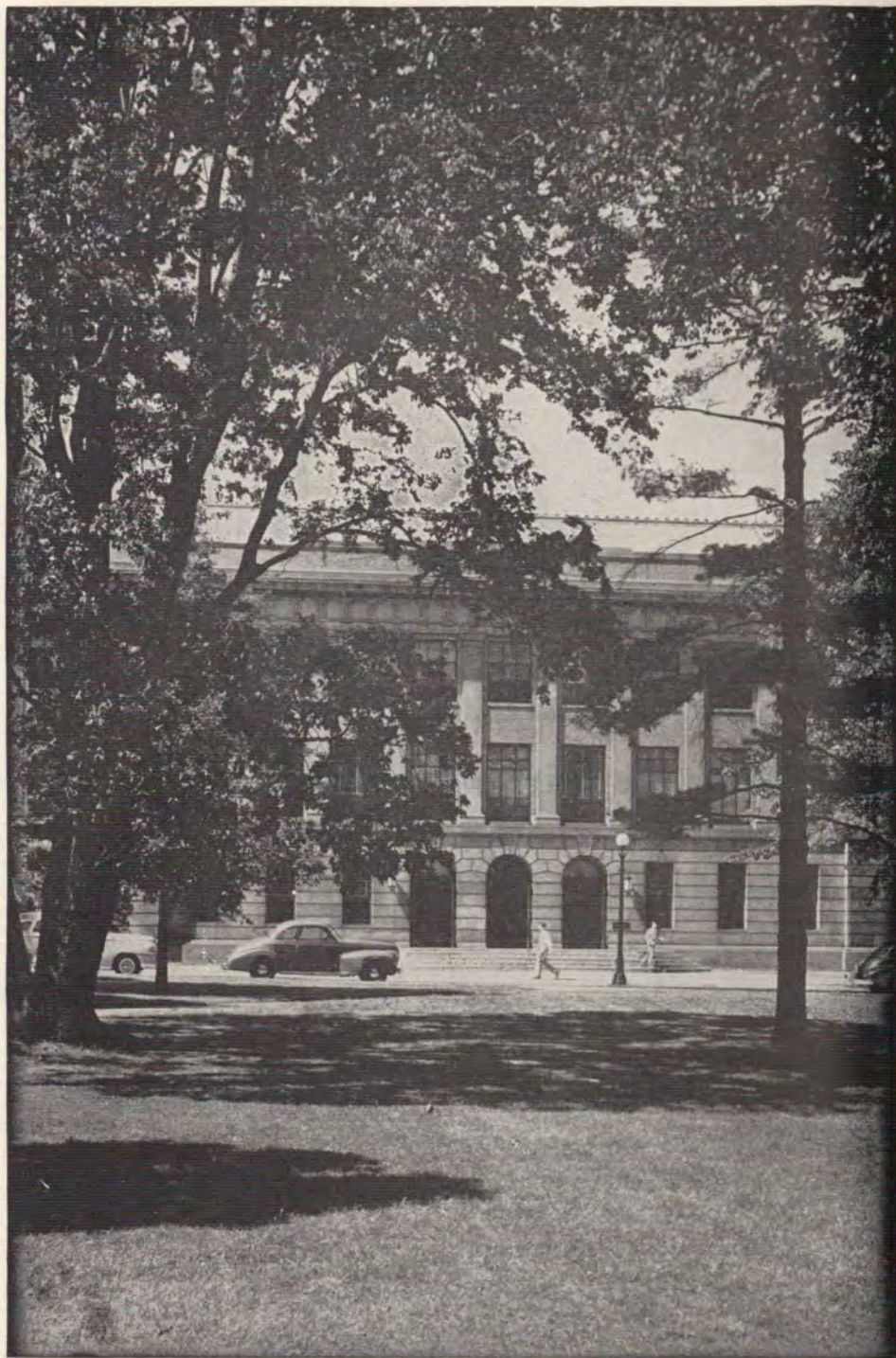
The Ohio State University Bulletin is issued twenty-six times during the year; once each month in August, September, October, November, and December; twice each month in January, February, and March; three times each month in April, and four times each month in May, June, and July.

This Entrance Leads to the Campus



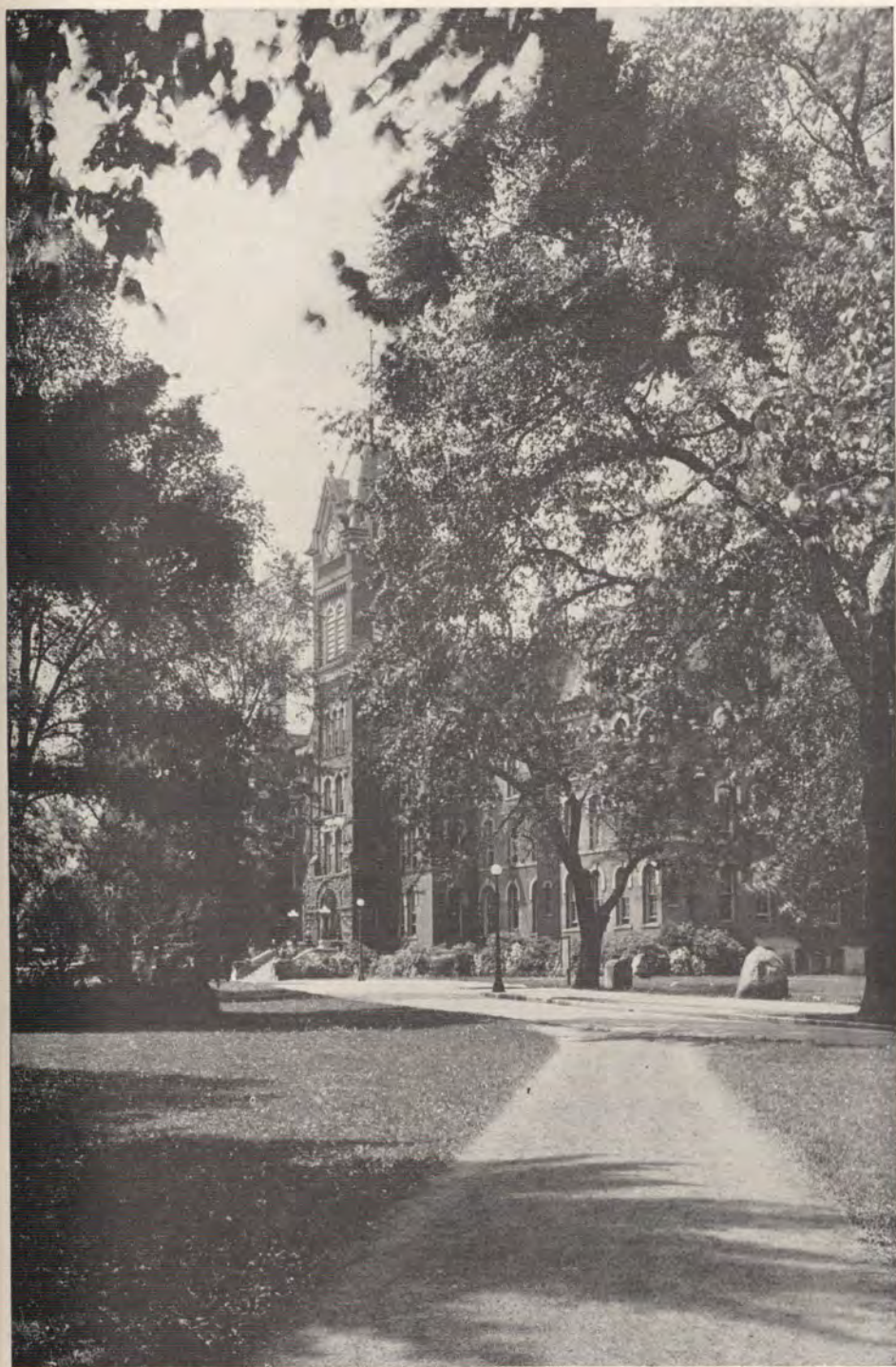
The Fifteenth Avenue Entrance, The Ohio State University

Campus Administrative Offices are Here



The Administration Building, The Ohio State University

The Ohio State University Started Here



University Hall, The Ohio State University, opened in 1873

One of the Campus Beauty Spots



The Wishing Well at Mirror Lake

GRADUATE SCHOOL

ISSUE FOR
1954-1955
SESSIONS

THE OHIO STATE UNIVERSITY
COLUMBUS

CONTENTS

PAGE

Ad Interim Work.....	37
Admission, Requirements for.....	30
Auditing Courses.....	33
Classification of Graduate Students.....	31
Concurrent Registration in Professional Colleges and the Graduate School..	34
Cooperative Agreements with Other Institutions on Research and Graduate Work.....	13
Courses of General Interest.....	51
Credit Hours for Part-time Students.....	36
Credit Toward a Master's Degree for Professional Courses.....	35
Fees and Expenses.....	20
Fellowships, Scholarships, and Assistantships.....	24
Grading System for Graduate Students.....	35
Graduate Record Examination.....	30
Graduate Work in the Summer Quarter.....	37
Interdepartmental Degree Programs.....	38
Living Arrangements.....	28
Off-Campus Research Work.....	37
Orientation Program.....	20
Prerequisites for 600 and 800 Courses.....	51
Registration, Method of Procedure for.....	32
Registration Dates.....	5, 21, 33
Requirements for Advanced Degrees.....	38
Stone Institute of Hydrobiology, Franz Theodore.....	38
Survey Courses.....	346
Total Credit in Any One Quarter.....	36
Withdrawal from the University.....	33

DEPARTMENTS OF INSTRUCTION

Accounting.....	52
Aeronautical Engineering.....	55
Agricultural Biochemistry.....	60
Agricultural Economics and Rural Sociology.....	63
Agricultural Education.....	65
Agricultural Engineering.....	68
Agricultural Experiment Station.....	69
Agricultural Extension.....	69
Agronomy.....	70
Anatomy.....	73
Animal Science.....	76
Anthropology.....	336
Architecture and Landscape Architecture.....	77
Astronomy.....	285
Bacteriology.....	78
Botany and Plant Pathology.....	82
Bureau of Business Research.....	87
Bureau of Educational Research.....	87
Bureau of Special and Adult Education.....	88
Business Organization.....	91
Ceramic Engineering.....	102
Chemical Engineering.....	106
Chemistry.....	111
Civil Engineering.....	120
Classical Languages and Literature.....	124
Dairy Science.....	127
Dairy Technology.....	128
Dentistry.....	130
Economics.....	132
Education.....	140
Electrical Engineering.....	166
Engineering Drawing.....	175
Engineering Experiment Station.....	175
Engineering Mechanics.....	175

English	178
Fine and Applied Arts.....	183
Genetics	189
Geodesy, Photogrammetry, and Cartography, Institute of.....	190
Geography	190
Geology.....	194
German.....	200
History	202
Home Economics.....	209
Horticulture and Forestry.....	216
Hydrobiology	219
Industrial Engineering	222
International Studies.....	227
Journalism	228
Law	230
Linguistic Studies.....	231
Mathematics	232
Mechanical Engineering.....	238
Mechanics.....	243
Medicine	243
Metallurgy	243
Meteorology.....	247
Mineralogy.....	247
Mining and Petroleum Engineering.....	249
Music.....	251
Nursing.....	257
Obstetrics and Gynecology	259
Optometry (Physiological Optics).....	259
Pathology.....	261
Pediatrics.....	264
Pharmacy.....	264
Philosophy	267
Photography	272
Physical Education.....	273
Physics and Astronomy.....	278
Physiological Chemistry and Pharmacology.....	287
Physiological Optics.....	259
Physiology	290
Political Science.....	293
Poultry Science.....	298
Preventive Medicine.....	299
Psychiatry	300
Psychology.....	301
Public Administration.....	314
Radiology.....	315
Romance Languages and Literatures.....	316
Social Administration.....	324
Sociology and Anthropology.....	332
Speech.....	338
Surgery.....	346
Veterinary Anatomy.....	346
Veterinary Clinics, Veterinary Medicine.....	347
Veterinary Parasitology, Veterinary Pathology.....	348, 349
Veterinary Physiology and Pharmacology.....	350
Veterinary Preventive Medicine.....	350
Veterinary Research, Veterinary Surgery.....	350, 351
Welding Engineering.....	351
Zoology and Entomology.....	353

UNIVERSITY CALENDAR

SUMMER QUARTER

June 21
June 21
June 22
July 21
July 22-23
July 23
July 26
August 2

August 3

August 26-27
August 27
August 27
September 1

1954

Orientation Program for all new students begins.
Last day for registration and paying fees before classes begin.
Classes begin, 8:00 A.M.
Last day for withdrawal with any refund of fees.
Final Examinations, first term (at last regular class hour).
First term ends, 12 Midnight
Second term begins, 8:00 A.M.
Schedule cards for Autumn Quarter may be obtained in the Registrar's Office.
Schedule cards for Autumn Quarter may be filed in College Office.
Final Examinations to be given last two days of classes.
Summer Convocation (Commencement), 9:00 A.M.
Summer Quarter ends, 12 Midnight.
Latest day for filing Autumn Quarter schedule cards without penalty.

AUTUMN QUARTER

September 22-27
September 27
September 28
October 27
October 29

November 1

November 9

November 11
November 25, 26, 27
December 13-17
December 17
December 17

Orientation Week for all new students.
Last day for registration and paying fees before classes begin.
Classes begin, 8:00 A.M.
Last day for withdrawal with any refund of fees.
Schedule cards for Winter Quarter may be obtained in Registrar's Office.
Schedule cards for Winter Quarter may be filed in College Office.
Latest day for filing Winter Quarter schedule cards without penalty.
Armistice Day. No classes.
Thanksgiving Vacation.
Final Examinations.
Autumn Convocation (Commencement), 2:00 P.M.
Autumn Quarter ends, 12 Midnight.

WINTER QUARTER

January 3
January 3
January 4
February 1

February 2

February 2
February 8

February 22
March 14-18
March 18
March 18

1955

Orientation Program for all new students begins.
Last day for registration and paying fees before classes begin.
Classes begin, 8:00 A.M.
Schedule cards for Spring Quarter may be obtained in the Registrar's Office.
Schedule cards for Spring Quarter may be filed in the College Office.
Last day for withdrawal with any refund of fees.
Latest day for filing Spring Quarter schedule cards without penalty.
Washington's Birthday. No classes.
Final Examinations.
Winter Convocation (Commencement), 2:00 P.M.
Winter Quarter ends, 12 Midnight

SPRING QUARTER

March 28
March 28
March 29
April 27
May 3

May 4

May 11

May 30
June 6-10
June 10
June 10
June 10

Orientation Program for all new students begins.
Last day for registration and paying fees before classes begin.
Classes begin, 8:00 A.M.
Last day for withdrawal with any refund of fees.
Schedule cards for Summer Quarter may be obtained in the Registrar's Office.
Schedule cards for Summer Quarter may be filed in the College Office.
Latest day for filing Summer Quarter schedule cards without penalty.
Memorial Day. No classes.
Final Examinations.
Class Day.
Spring Convocation (Commencement).
Spring Quarter ends, 12 Midnight.

June 21
July 22
July 25
August 26

Summer Quarter (1955) classes begin.
Summer Quarter (1955) first term ends.
Summer Quarter (1955) second term begins.
Summer Quarter (1955) ends.

THE OHIO STATE UNIVERSITY

ADMINISTRATION

BOARD OF TRUSTEES

Chairman.....	CHARLES F. KETTERING
Office: Research Laboratories, General Motors, Box 188, North End Station, Detroit 2, Mich.	
Residence: Dayton, Ohio	
Vice Chairman.....	JOHN W. BRICKER
Office: 50 W. Broad St., Columbus, Ohio	
Residence: 2407 Tremont Rd., Columbus 12, Ohio	
Trustee.....	FORREST G. KETNER
Office: 1561 Leonard Ave., Columbus, Ohio	
Residence: 20 Stanbery Ave., Columbus 9, Ohio	
Trustee.....	JAMES W. HUFFMAN
Office: 8 E. Broad St., Columbus, Ohio	
Residence: 2620 E. Broad St., Columbus, Ohio	
Trustee.....	ROBERT F. BLACK
Office: White Motor Corporation, Cleveland 1, Ohio	
Residence: 2959 Fairmount Blvd., Cleveland, Ohio	
Trustee.....	CARLTON S. DARGUSCH
Office: 44 E. Broad St., Columbus, Ohio	
Residence: 271 N. Columbia Ave., Columbus 9, Ohio	
Trustee.....	ROBERT N. GORMAN
Office: Traction Building, Cincinnati, Ohio	
Residence: 1010 Brayton Ave., Wyoming, Cincinnati, Ohio	
Secretary of the Board of Trustees.....	CARL E. STEEB
Office: Administration Building—UN-3148, Ext. 332	
Residence: 198 W. 11th Ave.—UN-4732	

ADMINISTRATIVE OFFICERS

President.....	HOWARD LANDIS BEVIS
Office: Administration Building—UN-3148, Ext. 100	
Residence: Ohio State University Campus—UN-3148, Ext. 274	
Vice President and Business Manager; Treasurer of the University.....	JACOB B. TAYLOR
Office: Administration Building—UN-3148, Ext. 300	
Residence: 2291 Tremont Rd.—HU-8-2534	
Vice President.....	BLAND L. STRADLEY
Office: 104 Administration Building—UN-3148, Ext. 8306	
Residence: 43 Columbus St., Canal Winchester—FR-7-4140	
Vice President.....	FREDERIC W. HEIMBERGER
Office: Administration Building—UN-3148, Ext. 101	
Residence: 2376 Abington Rd.—HU-8-0590	
Registrar, University Examiner, and University Editor.....	RONALD B. THOMPSON
Office: Administration Building—UN-3148, Ext. 314, 318	
Residence: 39 Chatham Rd.—LA-8096	
Director of Personnel Budget.....	SAMUEL R. BEITLER
Office: 311 Administration Building—UN-3148, Ext. 377	
Residence: 71 W. Beaumont Rd.—LA-3183	
Executive Clerk.....	KATHERINE A. VOGEL
Office: Administration Building—UN-3148, Ext. 100	
Residence: 4511 Rosemont Pl.—LA-1628	
Comptroller.....	CHARLES A. KUNTZ
Office: Administration Building—UN-3148, Ext. 332	
Residence: 568 Yaronia Dr., Indian Springs—LA-3606	
Dean of Men.....	MYLIN H. ROSS
Office: 108 Administration Building—UN-3148, Ext. 8201	
Residence: 1876 Coventry Rd.—HU-8-7437	
Dean of Women.....	CHRISTINE YERGES CONAWAY
Office: 216 Pomerene Hall—UN-3148, Ext. 731	
Residence: 2230 Glenn Ave.—HU-8-1770	
Secretary of the University Faculty and Faculty Council.....	LAWRENCE D. JONES
Office: 120 McPherson Chemical Laboratory—UN-3148, Ext. 301	
Residence: 184 E. Torrence Rd.—LA-4625	
Director of the Bureau of Public Relations.....	WILLIAM G. WILCOX
Office: 106 Administration Building—UN-3148, Ext. 532	
Residence: 2594 Berwyn Rd.—HU-8-0806	
Director of the Twilight School.....	LUKE K. COOPERRIDER
Office: 102 Administration Building—UN-3148, Ext. 738	
Residence: 221 Amazon Pl.—LU-4827	

THE GRADUATE SCHOOL

1954-1955

Dean.....	N. PAUL HUDSON
Office: 809 Administration Building—UN-8148, Ext. 717	
Residence: 1680 Arlington Ave.—HU-8-6254	
Dean Emeritus.....	ALPHEUS W. SMITH
Office: New Physics Bldg.—UN-8148, Ext. 8451	
Residence: 232 16th Ave.—WA-1924	
Assistant Dean.....	DUNCAN McCONNELL
Office: 809 Administration Building—UN-8148, Ext. 717	
Residence: 2154 Fairfax Rd.—HU-8-4002	
Assistant Dean.....	EVERETT WALTERS
Office: 809 Administration Building—UN-8148, Ext. 717	
Residence: 400 W. 7th Ave.—WA-0062	
Secretary.....	ALICE A. MORAN
Office: 809 Administration Building—UN-8148, Ext. 718	
Residence: 987 Woodhill Dr.—HU-8-6048	

THE GRADUATE COUNCIL

1953-1954

N. PAUL HUDSON, Ph.D., M.D., Sc.D., Dean, Chairman, *ex officio*
 DUNCAN McCONNELL, Ph.D., Assistant Dean
 EVERETT WALTERS, Ph.D., Assistant Dean
 KENNETH M. ABBOTT, Ph.D., Professor of Classical Languages
 RICHARD D. ALTICK, Ph.D., Professor of English
 EDMUND D. AYRES, S.M., Professor of Electrical Engineering
 VIVA B. BOOTHE, Ph.D., Director of the Bureau of Business Research
 LEWIS C. BRANSCOMB, A.M.L.S., University Librarian
 HOWARD D. BROWN, Ph.D., Professor of Horticulture
 ARTHUR S. DANIELS, Ed.D., Professor of Physical Education
 FRED E. DEATHERAGE, Ph.D., Professor of Agricultural Biochemistry
 ARTHUR W. FOSHAY, Ed.D., Director of the Bureau of Educational Research
 JAMES W. GRIMES, Ph.D., Professor of Fine Arts
 GEORGE R. HAVENS, Ph.D., Professor of Romance Languages
 HELENE HEYE, Ph.D., Professor of Home Economics
 MICHAEL J. JUCIUS, Ph.D., Professor of Business Organization
 W. E. KRAUSS, Ph.D., Representing the Agricultural Experiment Station
 CARL A. LAMEY, Ph.D., Professor of Geology
 THOMAS H. LANGLOIS, M.S., Ph.D., Director of the Franz Theodore Stone Institute of
 Hydrobiology and Professor of Hydrobiology
 EDWIN N. LASSETTRE, Ph.D., Professor of Chemistry
 NATHAN LAZAR, Ph.D., Associate Professor of Education
 CHARLES B. MENDENHALL, Ph.D., Professor of Education
 WILLIAM G. MYERS, Ph.D., M.D., Julius Stone Research Associate Professor of Medical
 Biophysics
 EVERETT J. NELSON, Ph.D., Professor of Philosophy
 ERIC OGDEN, Professor of Physiology
 PAUL V. REICHELDERFER, Ph.D., Professor of Mathematics
 EVERETT C. SHIMP, M.A., Professor of Social Administration
 WALTER G. VENZKE, Associate Professor of Veterinary Medicine
 DELOS D. WICKENS, Ph.D., Professor of Psychology
 DOUGLAS C. WILLIAMS, Ph.D., Associate Professor of Industrial Engineering
 ORAM C. WOOLPERT, Ph.D., M.D., Director, Research Foundation
 ALFRED J. WRIGHT, Ph.D., Professor of Geography
 LAURA ZIRBES, Ph.D., Professor of Education

FELLOWSHIPS AND SCHOLARSHIPS FOR THE YEAR 1953-1954

POST-DOCTORAL

MARY S. MUELLHAUPT SCHOLARSHIPS

MYSORE ANANTASWAMY RAU.....	Botany
CHARLES FRANCIS SMITH.....	Zoology
MOSTAFA KAMAL HAMDY.....	Bacteriology
EDWARD RITTER	Zoology

ELIZABETH CLAY HOWALD SCHOLARSHIP

MORTON WILFRED BLOOMFIELD.....	English
--------------------------------	---------

UNIVERSITY POST-DOCTORAL FELLOWSHIP

MARK GOLDSMITH	Physics
----------------------	---------

ELI LILLEY & CO. FELLOWSHIP

SAMI A. MAYYASI.....	Bacteriology
----------------------	--------------

PRE-DOCTORAL

STILLMAN W. ROBINSON FELLOWSHIP

SHUNJI MANABE.....	Electrical Engineering
--------------------	------------------------

JOHN A. BOWNOCKER FELLOWSHIP AND SCHOLARSHIPS

RICHARD W. BAYLEY	Geology
RICHARD S. BOWMAN.....	Geology
CHRISTIAAN de WYS.....	Geology

BATTELLE MEMORIAL INSTITUTE FELLOWSHIPS

DAVID STEPHAN.....	Chemical Engineering
CARL SCHLEA.....	Chemical Engineering

ALBERTA GARBER SCOTT FELLOWSHIP

THOMAS GRANT EYNON.....	Sociology
-------------------------	-----------

EDWARD ORTON JUNIOR CERAMIC FOUNDATION FELLOWSHIP

CAMILO VALENCIA.....	Ceramic Engineering
----------------------	---------------------

UNIVERSITY FELLOWSHIPS

EARL ARTHUR ALLUISI.....	Psychology
EUGENE WALDO BUSHALA.....	Classical Languages
AHMAD TAHA HABIB.....	Horticulture
ROBERT JOHN HAHN.....	History
CHIO-SHIN LIN	Mathematics
ROBERT EDWARD MITCHELL.....	Romance Languages
JULIUS PAUL	Political Science
GERALD EDWARD RABKIN.....	English
ALAN MAXWELL REES.....	History
CARL EDWIN SHULL.....	Fine Arts

UNIVERSITY SCHOLARSHIPS

DORIS JEANNE BOARDMAN.....	Fine Arts
JAMES BIERI	Psychology
ROBERT SHIRLEY FORBES.....	Entomology
KENNETH CLIVE GRAY.....	Psychology
IRVING HANDLIN	Speech
NOREJANE JOHNSTON HENDRICKSON (MRS.).....	Education
ALAN STANLEY HOROWITZ.....	Geology
LESTER ARTHUR KNORR.....	Fine Arts
NAKAJI KOJIMA	Horticulture
MARY LOUISE KUHN.....	Fine Arts
ROSE CLAIRE FALICK LYNN (MRS.).....	English
THOMAS E. MADIGAN.....	Geography
PAUL McSTALLWORTH	History
HELEN JEAN NEESER.....	Romance Languages
HENRY DEAN OSTBERG.....	Business Organization
MANDAKINI GANPATISING PARDESHI.....	Education
SALOMON RETTIG	Psychology
CARL FREDERICK ROTHE.....	Physiology
GORDON JAMES RYDER.....	Agricultural Education
MYUNG WON SHIM.....	Economics

FELLOWS AND SCHOLARS

9

WALTER MARTIN SMITH.....	Accounting
DANIEL TANNENBAUM	Agricultural Education
WALTER RAOUL WEITZMANN.....	History
BRUCE WENDELL WILKINSON.....	Chemical Engineering
IRVIN M. YOUNGERMAN.....	Business Organization

AMERICAN FOUNDATION FOR PHARMACEUTICAL EDUCATION FELLOWSHIPS

ALLEN I. DINES.....	Pharmacy
FRED T. GALYSH.....	Pharmacy
WILLIS E. MOORE.....	Pharmacy
RAMONA ELIZABETH PARKINSON.....	Pharmacy
CARL A. SCHLAGEL.....	Pharmacy

SENIOR CONSERVATION FELLOWSHIPS

ANTHONY BODOLA	Hydrobiology
EDWARD C. KINNEY, JR.....	Hydrobiology
DAVID HONOR STANSBERRY.....	Hydrobiology

AMERICAN DRY MILK COMPANY FELLOWSHIP

STAFFORD READ MERRILL.....	Agricultural Biochemistry
----------------------------	---------------------------

OHIO FLORISTS ASSOCIATION FELLOWSHIPS

PAUL M. ALEXANDER.....	Botany
HENRY PORTER ORR.....	Horticulture

INSTITUTE OF NUTRITION AND FOOD TECHNOLOGY CONSUMER PANEL FELLOWSHIP

GILBERT ROY DU VERNAY.....	Horticulture
----------------------------	--------------

HELENA CHAMBERLAIN MEMORIAL FELLOWSHIPS

PAUL F. BRINKPETER.....	Horticulture
RICHARD HAYDEN	Horticulture
JAMES OSBERT MAVIS	Horticulture
HOWARD A. ROLLINS, JR.....	Horticulture

OHIO STATE UNIVERSITY FLORICULTURE ALUMNI ASSOCIATION FELLOWSHIP

DANNIA M. GRIFFIN.....	Horticulture
------------------------	--------------

OHIO WILDLIFE FELLOWSHIPS

CHARLES GANGLOFF CRISPENS, JR.....	Zoology
ROBERT W. DONOHUE.....	Zoology

NATIONAL SOCIETY OF SALES TRAINING EXECUTIVES SCHOLARSHIP

JOHN JAMES GANNON.....	Business Organization
------------------------	-----------------------

PROCTOR AND GAMBLE COMPANY FELLOWSHIPS

ROBERT S. HATTERSLEY.....	Mechanical Engineering
RICHARD D. McIVER.....	Chemistry
DAVID ARTHUR STRANG.....	Chemical Engineering

SOCONY-VACUUM OIL COMPANY FELLOWSHIPS

DELMAR D. KREHBIEL.....	Chemistry
RICHARD H. GROTH.....	Chemistry

UPJOHN COMPANY FELLOWSHIPS

ALLEN I. DINES.....	Pharmacy
HOWARD J. LEVIN.....	Pharmacy

S. C. JOHNSON WAX COMPANY FELLOWSHIP

LESLIE NORMAN COLE.....	Agricultural Biochemistry
-------------------------	---------------------------

COMMUNITY CHESTS AND COUNCILS SCHOLARSHIPS

MARILYN LIEBERMAN KONOSKIE.....	Social Administration
ESTHER FRIEDLAND REISMAN.....	Social Administration

ERDIS G. ROBINSON SCHOLARSHIP

MARY JANE McCONAUGHY.....	Social Administration
---------------------------	-----------------------

PAN AMERICAN SCHOLARSHIP

MARTHA EUGENIA MORELLO.....	English
-----------------------------	---------

JAMES E. HAGERTY SCHOLARSHIPS

RAYMOND BENNER AUKER.....	Social Administration
HARRY ZIBNERS	Social Administration
WILLIAM LAZAR	Social Administration
ERNEST PAUL DONALD.....	Social Administration
CONSTANCE VAN TYNE.....	Social Administration

ROBERT G. PATERSON SCHOLARSHIP

EDWARD C. BAUMHEIER.....	Social Administration
--------------------------	-----------------------

MARGARET L. WHITE SCHOLARSHIP

ANTOINETTE LOWRY BARR.....	Education
----------------------------	-----------

F. H. PATTERSON SCHOLARSHIP

JAMES N. MILLER.....	Social Administration
ALICE JANE PALMER.....	Social Administration

VISKING CORPORATION FELLOWSHIP

SHIRLEY E. LIPPINCOTT.....	Chemistry
----------------------------	-----------

MONSANTO CHEMICAL COMPANY FELLOWSHIP

ROBERT M. HALL.....	Chemistry
---------------------	-----------

CINCINNATI CHEMICAL WORKS FELLOWSHIP

CHARLES T. ANDERSON.....	Chemistry
--------------------------	-----------

CRANE COMPANY FELLOWSHIP

RICHARD E. KUTCHERA.....	Welding Engineering
--------------------------	---------------------

OHIO HYBRID SEED CORN PRODUCERS FELLOWSHIPS

THOMAS R. TEGEMKAMP.....	Agronomy
SANKARA K. MENON	Botany

QUAKER OATS COMPANY FELLOWSHIPS

KENNETH E. KOLB.....	Chemistry
CALVIN J. BENNING.....	Chemistry

NATIONAL SCIENCE FOUNDATION FELLOWSHIP

RICHARD J. HOWARD.....	Physics
------------------------	---------

FIRESTONE TIRE AND RUBBER COMPANY FELLOWSHIP

ARLO DYE BOGGS.....	Chemistry
---------------------	-----------

FOUNDRY EDUCATIONAL FOUNDATION FELLOWSHIP

DAVID C. EKEY.....	Industrial Engineering
--------------------	------------------------

WESTINGHOUSE COMPANY FELLOWSHIP

KENT R. SHELLERNE.....	Mechanical Engineering
------------------------	------------------------

JOHN H. SMITH SCHOLARSHIPS

THELMA Z. BLOOMFIELD.....	Social Administration
JOHN P. DONOVAN, JR.....	Social Administration
ALBERT L. RHOTON.....	Social Administration

E. I. duPONT de NEMOURS AND COMPANY FELLOWSHIPS

THOMAS F. SASIHARA.....	Chemical Engineering
ROY JOHNSON	Metallurgy
WILLIAM L. PILLINGER.....	Physics

KETTERING FOUNDATION FELLOWSHIPS

THOMAS BROWN	Botany
WENDELL BYRD	Chemistry
KENNETH WEBB	Botany

EASTMAN KODAK COMPANY FELLOWSHIP

RICHARD ALBERT FITZ.....	Chemical Engineering
--------------------------	----------------------

PARKE, DAVIS AND COMPANY FELLOWSHIPS

WILLIAM ROBB STERLING.....	Pharmacy
WILLIAM IAN WOOLLEY.....	Pharmacy

M. R. BISSELL SCHOLARSHIP

MIRIAM LERNER.....	Social Administration
--------------------	-----------------------

SCHOOL OF SOCIAL ADMINISTRATION ASSOCIATES SCHOLARSHIPS

MARY JANE McCONAUGHEY.....	Social Administration
FLORENCE WHITEMAN.....	Social Administration
LOIS MARILLYN DOESCHER.....	Social Administration

C. C. STILLMAN SCHOLARSHIP

ALLEN PRESTON DANIEL.....	Social Administration
JOHN J. ROSENBLATT.....	Social Administration
JOHN P. DONOVAN.....	Social Administration
RALPH RAYMOND PIDCOCK.....	Social Administration

ALLIED CHEMICAL AND DYE COMPANY FELLOWSHIPS

ROBERT M. SMITH.....	Chemistry
DEAN K. WALTON.....	Chemistry

ROSES, INC. FELLOWSHIP

CHIKO HARRAMAKI.....	Horticulture
----------------------	--------------

U. S. PUBLIC HEALTH SCHOLARSHIPS

ROBERT EUGENE JONES.....	Psychology
LEE BURTON SECHREST.....	Psychology
BERNARD JOSEPH FITZGERALD.....	Psychology
LEON H. LEVY.....	Psychology
WALTER MISCHER.....	Psychology
JAMES NEAL JOYCE.....	Psychology

GENERAL ELECTRIC COMPANY FELLOWSHIP

WARREN O. GROVES.....	Chemistry
-----------------------	-----------

GREEN GIANT COMPANY FELLOWSHIP

ALBERT JOHN LINCK.....	Botany
------------------------	--------

STANDARD OIL COMPANY OF INDIANA FELLOWSHIP

HARRY WILSON LING.....	Chemistry
------------------------	-----------

CARBIDE AND CARBON FELLOWSHIP

RUSSELL LEE KENNETH CARR.....	Chemistry
-------------------------------	-----------

RESEARCH CORPORATION FELLOWSHIP

ROGER W. ADDOR.....	Chemistry
---------------------	-----------

SHELL OIL COMPANY FELLOWSHIP

BRUCE DANIEL GILES.....	Chemical Engineering
-------------------------	----------------------

AMERICAN CYANAMID COMPANY FELLOWSHIP

EDWARD J. SCHARF.....	Chemical Engineering
-----------------------	----------------------

ETHYL CORPORATION FELLOWSHIP

ROLAND GRAY LINDSEY.....	Chemical Engineering
--------------------------	----------------------

TEXAS COMPANY FELLOWSHIP

WALTER B. LOEWENSTEIN.....	Physics
----------------------------	---------

OHIO NURSERYMEN'S ASSOCIATION FELLOWSHIP

JOHN E. STRATE.....	Horticulture
---------------------	--------------

OHIO CANNERS ASSOCIATION FELLOWSHIP

HAROLD HARLAND HALE.....	Horticulture
--------------------------	--------------

OHIO FEDERATION OF MUSIC CLUBS SCHOLARSHIP

ALICE ELOISE BAKER.....	Music
-------------------------	-------

NATIONAL INSTITUTES OF HEALTH FELLOWSHIP

WILLIAM J. WEBER.....	Bacteriology
-----------------------	--------------

OHIO FLORISTS ASSOCIATION FELLOWSHIP

RALPH EBERT DOREN.....	Horticulture
------------------------	--------------

CLEVELAND BETTER HOMES FELLOWSHIP

ROBERT JEROME HANZEL.....	Horticulture
---------------------------	--------------

GARDNER COTTRELL RESEARCH FELLOWSHIP

RICHARD C. SAPP.....	Physics
----------------------	---------

THE OHIO STATE UNIVERSITY

LOCATION

The Ohio State University is situated within the corporate limits of the city of Columbus. It is supported by appropriations from the State and Federal governments. The University has 2,175 acres of land with 417 acres in the campus, 383 acres in the University Airport, 295 acres in golf course, and 1,080 acres in the farm. The total value of land, buildings, and equipment is \$68,956,097.14.

ORGANIZATION

For convenience of administration the departments of the University are grouped into organizations called Colleges. The Ohio State University comprises ten Colleges and a Graduate School, each under the administration of a Dean and College Faculty, as follows:

Graduate School, College of Agriculture (including the School of Home Economics), College of Arts and Sciences (including the School of Journalism and the School of Optometry), College of Commerce and Administration (including the School of Social Administration), College of Dentistry, College of Education (including the School of Fine and Applied Arts and the School of Music), College of Engineering (including the School of Architecture and Landscape Architecture and the School of Mineral Industries), College of Law, College of Medicine (including the School of Nursing), College of Pharmacy, College of Veterinary Medicine.

NOTE: Bulletins describing the work of the several Colleges may be obtained by addressing the University Examiner. The Ohio State University, Columbus 10, and stating the College in which the writer is interested. (For list of bulletins, see the last page.)

THE UNIVERSITY YEAR—FOUR QUARTERS

The University year is divided into four Quarters, each approximately eleven weeks in length. The Summer Quarter is further divided into two terms of approximately six weeks each. Complete courses that are so announced may be taken for either term or for the entire Quarter.

This *Bulletin* is devoted to the work of the Graduate School for the Autumn, Winter, and Spring Quarters, 1954-1955. The announcements for the Summer Quarter are printed in the Summer Quarter Bulletin.

THE GRADUATE SCHOOL

GENERAL INFORMATION

The office of the Graduate School is located in Room 309, Administration Building. The office is open from 8:00 a. m. to 5:00 p. m. daily, except Saturday. On Saturday, it is open from 8:00 a. m. to 12:00 m.

ORGANIZATION AND ADMINISTRATION

The instruction and training of graduate students has been one of the functions of The Ohio State University since 1878, when the first graduate student was in residence. For a number of years the graduate work of the University was unorganized and each department conducted its own work with little reference to that of other departments. After the University was divided into colleges, each college controlled the graduate work offered in the various

departments constituting that college. In 1902, however, the graduate work within the College of Arts had assumed sufficient proportions to warrant the organization of a Graduate School to secure an effective and systematic arrangement of the graduate work of that college. Finally in 1911, there was organized the Graduate School of the University to administer all the graduate work offered in the several departments of the University. This School is under the administration of a Graduate Council consisting of thirty-five members. The membership of the Council is made up of the following: the Dean of the Graduate School, two Assistant Deans, the Director of the Bureau of Educational Research, the Director of the Bureau of Business Research, the Director of the Engineering Experiment Station, the Director of the Research Foundation, a representative of the Ohio Agricultural Experiment Station, the Director of the Franz Theodore Stone Institute of Hydrobiology, the University Librarian, and twenty-four members of the instructional staff appointed by the President from among those areas in the University offering graduate work. This Council reports directly to the Faculty Council which is the legislative body of the University.

All communications and inquiries regarding matters connected with the Graduate School, whether from prospective students or from those whose work is in progress, should be directed to the Office of the Graduate School.

AGREEMENTS BETWEEN THE OHIO STATE UNIVERSITY AND OTHER INSTITUTIONS CONCERNING GRADUATE WORK

In order that certain educational and research institutions may be able to take advantage of the facilities of the Graduate School, and also in order that these institutions may be utilized for the pursuit of research work in connection with the Graduate School, agreements have been made between the Board of Trustees of The Ohio State University and the following institutions:

(a) With the Merrill-Palmer School. A graduate of The Ohio State University who has completed all the necessary undergraduate requirements may fulfill the residence requirement for the Master's degree by satisfactorily completing one Quarter of acceptable work in residence at The Ohio State University, and two additional Quarters of acceptable work in residence at the Merrill-Palmer School. Before entering the Merrill-Palmer School, the candidate must confer with the chairman of the department at The Ohio State University in which he wishes to specialize, under whose direction a general course of study for the Master's degree will be arranged. The thesis subject must be of such character as to enable the candidate to carry on experimental work at the Merrill-Palmer School.

The final examination of the candidate will be conducted by a committee consisting of members of the instructional staff of this University together with representatives of the Merrill-Palmer School, according to the rules governing the Master's degree. The thesis must meet with the approval of both the Merrill-Palmer School and this University.

Students carrying on work at the Merrill-Palmer School under the above regulations must also register at the same time in the Graduate School of this University, but will not be required to pay fees in this University.

(b) The Perkins Observatory. The Perkins Observatory is jointly maintained and administered by the Ohio Wesleyan University and The Ohio State University. Its facilities are, therefore, available for students registered in the Graduate School desiring to pursue research work in astronomy or astrophysics.

The principal instrument of the Observatory is a large reflecting telescope, the mirror for which was cast by the Bureau of Standards and is the first large piece of optical glass made in this country. The reflecting surface measures 69 inches in diameter and offers an unusual equipment for astronomical and astrophysical research. There is an auxiliary photographic doublet for six-inch aperture, and solar objective of 25 feet focal length.

The Observatory is also provided with auxiliary scientific equipment which will afford special facilities for photometric, spectroscopic, and radiometric investigations.

The main building houses the offices for the staff, a lecture room, a spacious library, research laboratory, photographic dark rooms, and an instrument shop for the construction of special apparatus.

Members of the scientific staff of the Observatory are also members of the staff of the Department of Physics and Astronomy. The facilities of the Mendenhall Laboratory of Physics and the Emerson McMillin Observatory are available as far as possible to supplement the facilities of the Perkins Observatory, and the staff of the Mendenhall Laboratory of Physics cooperates fully with the staff of the Observatory in the supervision and direction of research. Unusual opportunities are thus offered for graduate and research work in astronomy and astrophysics.

(c) With the Bureau of Juvenile Research of the State of Ohio. Students who are registered in the Graduate School of The Ohio State University and who are candidates for a Master's degree, specializing in Clinical Psychology, may do not to exceed one-third of the work required for this degree at the Bureau of Juvenile Research. All such work must be approved in advance by a professional member of the Clinical Division of the Department of Psychology, and all credits received for such work must be submitted under his signature.

Candidates for the degree of Doctor of Philosophy specializing in Clinical Psychology, may likewise carry on work at the Bureau of Juvenile Research. The amount of such work shall be determined in each individual case by a professional member of the Division of Clinical Psychology of the Department of Psychology and the Dean of the Graduate School, but in no case will this amount exceed one-third of the total requirements for the degree of Doctor of Philosophy.

Students carrying work at the Bureau of Juvenile Research must be registered in the Graduate School of this University during the time in which they are pursuing such work.

The Bureau of Juvenile Research offers a limited number of full-time internships for qualified graduate students majoring in clinical psychology.

(d) With the Battelle Memorial Institute. Students who are registered in the Graduate School of The Ohio State University, specializing in certain fields of engineering, especially in metallurgy, fuels and allied fields, may carry on their research work at the Battelle Memorial Institute with permission of the department concerned. The credit for such work must be submitted under the signature of the professor in charge of the work, who must be a member of the appropriate department of the University.

(e) With the Kettering Research Foundation. The Ohio State University has entered into an agreement with the Kettering Research Foundation at Antioch College which makes it possible for candidates for the Ph.D. degree to carry out the research work essential for a dissertation at the Kettering Foundation. This work must be done under the general direction of the appropriate department in The Ohio State University.

The research work of the Kettering Foundation is directed largely to a study of chlorophyll and photosynthesis. Excellent opportunities are offered to those interested in these and related fields of biophysics, biochemistry and plant physiology. Ample facilities and a competent scientific staff are available. Such a program of research, when offered as a dissertation, must meet both the requirements and the standards of The Ohio State University and the Kettering Foundation.

Students may obtain as much as two years of residence for research carried out at the Kettering Research Foundation. They must, however, register simultaneously in the Graduate School of The Ohio State University. During

this period they are exempt from all fees except the matriculation fee of \$15.00 and the graduation fee when the degree is received. At least one year of full-time residence must be spent at The Ohio State University doing the course work necessary for the Ph.D. degree. During this year of residence, the regular incidental, laboratory and tuition fees must be paid, unless the student has been appointed to a Kettering Research Foundation Fellowship.

Students registering under this plan must obtain the approval of the department concerned, must have an appointment at the Kettering Research Foundation and must meet all the requirements for the Ph.D. degree as imposed by The Ohio State University.

(f) With the Samuel S. Fels Institute for the Study of Prenatal and Postnatal Environment. A cooperative agreement between the Graduate School of The Ohio State University and The Samuel S. Fels Institute for the Study of Prenatal and Postnatal Environment at Antioch College permits graduate students to complete the thesis or dissertation, in whole or in part, at the Fels Institute.

The Fels Institute is engaged in an important investigation of the environment and hereditary factors controlling child development. A considerable number of research projects are under way. Cooperative relations have been established with other research laboratories and institutions. Excellent research opportunities are provided for those interested in this field of science.

Students may earn one year of residence toward the Ph.D. degree, forty-five Quarter hours, or fifteen Quarter hours toward the Master's degree, while carrying on research at Fels Institute. They must register in the Graduate School of The Ohio State University while completing this work. During this period they must pay the usual fees, except those students holding fellowships or scholarships awarded either by The Ohio State University or the Fels Foundation.

Students registering under this plan must obtain the approval of the Department of Psychology and must meet all the requirements for the Master's or Ph.D. degrees as imposed by The Ohio State University.

THE UNIVERSITY LIBRARIES

The University Libraries consist of all books owned by the University and number over 1,000,000 volumes. The main part of the Library, which is known as the General Library, is housed in the Library Building. Four graduate libraries have been established in the new addition consisting of English and Speech, History and Political Science, Modern Languages, and Philosophy and Classics. Very important divisions of the book collection are housed in other buildings. A catalog of the entire collection is maintained in the General Library.

Any person is privileged to use the University Library for reference, but books may be drawn for home use only by the staff and registered students of the University. Graduate students may use the stacks of the Library upon presentation of their fee cards at the main circulation desk.

The University Library is a depository for the official publications of the United States and has a very complete collection of these documents. It also receives thousands of documents from states, cities, and foreign countries. The Library also possesses the British Parliamentary Papers including the rare early volumes. The numerous series of the publications of the League of Nations are well represented in the library collections. The exchanges of the Ohio Academy of Science, of the Ohio State University Scientific Association and of the Ohio Biological Survey are deposited in the University Library.

A newly created Browsing Room is housed in the northwest corner of the General Library. Approximately 2,000 volumes of general and recreational reading, many being current publications, are available for extracurricular

reading by the University community. Included in the Browsing Room is a rental collection made possible by gifts of the Phi Eta Sigma honorary fraternity.

The University Library subscribes to the current author and subject catalog card service of the Library of Congress.

There are sixteen organized department libraries, each administered by a librarian.

The Botany and Zoology Library is located in the Botany and Zoology Building. The "Index to General Botanical Literature," the "Index to Algalogical Literature" and the card index to the Concilium Bibliographicum are in this departmental library.

Brown Hall Library, located in Brown Hall, contains collections of books on Architecture, Engineering Drawing, Civil Engineering, and Photography. The collection of plates filed in this library is especially valuable for students in Architecture.

The Charles Cutler Sharp Library is located in McPherson Chemical Laboratory. It contains not only the current periodicals and a large collection of dictionaries and handbooks on chemistry, but also complete sets of all important journals dealing with subjects lying within the general field of chemistry, chemical engineering, and related sciences.

The Commerce Library, in Hagerty Hall, includes a working collection of books for the students and faculty in the College of Commerce. The main reading room is located on the second floor. Here also is shelved the Charles Griffith Memorial Insurance Library. An additional study room is located in the southeast corner of the basement.

The A. F. Davis Welding Library, in Room 200, Industrial Engineering Building, represents a bringing together from several sections of materials on welding in its various aspects. Through the courtesy of the James F. Lincoln Arc Welding Foundation the prize papers of the 1937-1938, 1943, 1945-1946, 1946-1947, 1948, 1948-1949, 1949-1950 and 1950-1951 Award Program have been deposited in this collection as a contribution to research in the field. The centralization of books in mechanics and industrial engineering, with the books on welding, will make this collection a center of engineering research.

The Education Library is located in Arps Hall. It is organized for graduate work and includes complete sets of important educational and psychological periodicals, city and state reports, textbooks, and other works of reference on educational and psychological subjects.

The Law Library is in Page Hall. It includes all of the United States and state reports, the English reports, the Irish reports, the latest statutes, codes and session laws of the states, complete sets of all the important legal periodicals and an up-to-date collection of text-books. It is especially well equipped for the study of Ohio law.

The Lord Hall Library consists of collections of books on Ceramics, Mining, Metallurgy, and Mineralogy and is located in Lord Hall.

The Graduate Mathematics Library includes complete sets of all the leading periodicals as well as an extensive collection of books on mathematics. The Library is located in Room 311 of Mendenhall Laboratory. Housed in adjoining rooms are the libraries of the departments of Physics, Optometry, and Astronomy.

The Health Center Library is in Hamilton Hall. It consists of a working and reserved collection of books and periodicals in the fields of medicine, dentistry, nursing and optometry.

The Music Library is located on the first floor of Hughes Hall. It contains important collections of instrumental and choral music, records, orchestral and band scores, selected titles on the teaching and history of music, biographies of musicians and works on the appreciation of music.

The Orton Memorial Library, located in Orton Hall, is one of the finest geological libraries in the country. In addition, the Ohio Geological Survey deposits its document exchanges with the library. These two collections constitute a very complete set of official geological reports from the states, foreign governments, and scientific societies.

The Pharmacy-Bacteriology Library is located in the basement of the Pharmacy and Bacteriology Building. It comprises files of journals and selected titles in pharmacy and bacteriology designed to furnish a reference collection for the students in these departments.

The Alfred D. Cole Memorial Library of Physics occupies three rooms in the Mendenhall Laboratory of Physics. The nucleus of the collection is the former private library of Professor Cole. A memorial endowment fund contributed by the friends of Professor Cole provides for additions to this Library which cannot be secured from the regular Library funds for the maintenance of libraries. This library now contains not only current periodicals and selected books in the fields of physics and astronomy but also complete sets of all important periodicals which are devoted to physics and its applications. Books and periodicals in the field of mathematics and optics are also located in the Cole Memorial Library for the mutual convenience of the two departments.

River Road Library is located in the recreation building of the River Road housing area. It provides general and recreational reading for students and their families in this area. Approximately one thousand volumes make up the collection of good fiction, non-fiction, popular magazines, and general reference tools.

The Social Administration Library is located on the fourth floor of Stillman Hall. The library consists of texts, journals, serials, and particularly reports of Social Welfare Agencies selected from the University Collections and located in the Social Administration Library for the convenience of students and faculty in this field.

The Library of the College of Veterinary Medicine, located in the Veterinary Laboratory, contains a sizable number of bound volumes in this field, and also a large collection of bulletins, reports, reprints, and other unbound and uncatalogued material.

Smaller collections selected with special reference to the needs of the various departments are housed near their offices. Collections of this type have been developed for Animal Science in Plumb Hall and Journalism on the second floor of the Journalism Building. The books relating to the School of Fine and Applied Arts are collected in the Mantel Room in the General Library. The collections of the College of Engineering are at present scattered among the buildings housing the offices of the various departments. Ceramic Engineering and Mine Engineering are in Lord Hall. Architecture and Civil Engineering are in Brown Hall. Electrical Engineering and Mechanical Engineering are in Robinson Laboratory. Chemical Engineering is in McPherson Chemical Laboratory. Industrial Engineering, Mechanics, and the Davis Welding Library are in the Industrial Engineering Building. By reason of limitation of space in these office rooms, many of the sets of the Engineering periodicals with the exception of the most recent volumes, are shelved in the General Library or in the Stack Annex.

The Reference Library of the Bureau of Educational Research is located in Arps Hall. Services are available to all graduate students. In addition to its research materials, an Educational and Psychological Test File is maintained.

The Library of the Ohio Archaeological and Historical Society, which is on the University Campus, is at the service of the staff and students of the

University. This library is specializing in the history of Ohio and the Northwest and a very valuable collection is being built up. Its large Ohio newspaper collection is one of the most valuable in the Middle West.

The special library of Battelle Memorial Institute and the collections of the State Library and Columbus Public Library are open to faculty and students of the University and supplement in important fields the collections of the University Libraries.

THE STATE LIBRARY

The State Library, consisting of approximately 900,000 volumes, is also available and is especially valuable for its collection of state documents, Nineteenth Century and Ohioana materials.

THE UNIVERSITY PLACEMENT SERVICES

Placement services are provided by the various Colleges and Schools of the University. These services offer information to students and graduates concerning employment opportunities in the various fields, training and qualifications needed for these fields, and provide help in finding employment in the fields for which they are most interested and best qualified. Interviews are arranged between the employer and the individuals. Where service is provided, registration should be completed well in advance of graduation. Graduate students are invited to register and use these facilities at all times.

GRADUATE STUDENT LOANS

A limited amount of money is available for loans to graduate students upon application to the Dean of Women or the Dean of Men. Loans are made only to those students who have been in residence in The Ohio State University for at least one Quarter. The maximum amount loaned in any one year to an individual is \$1,000.

Phi Delta Gamma, graduate women's sorority, has available a loan fund for graduate women. Applications must be made to the President of Phi Delta Gamma.

UNIVERSITY HEALTH SERVICE

Baker Hall, Southeast Wing

Medical Staff: Dr. J. W. Wilce, Director; Dr. Theodore Allenbach, Dr. Shirley Armstrong, Dr. Karl Feistkorn, Dr. Earl H. Ryan, Dr. William Palchanis.

Part-time specialists and physicians at Service: Dr. H. P. Worstell, Dr. D. G. Sanor, Dr. John M. Lowery, Dr. Frances Harding, Dr. Maurice Zox, Dr. Joseph Gallen, Dr. James H. McCreary, Dr. J. J. Alpers, Dr. Drew J. Arnold, Dr. Milton Levitin, Dr. Harry J. Keys, Dr. William C. Stahl, Dr. Charles J. McKitrick, Dr. David H. Greeger, Dr. James R. Kauffman, Dr. Paul M. Hatfield, Dr. T. R. Williams, Dr. H. M. Platter, Dr. V. D. Stephens, and other occasional consultants, including University Hospital staff, seven nurses, one laboratory technician, and one X-ray technician.

Office Hours: When the University is in session, daily 8:00 to 4:30, and Saturday, 8:00 to 12:00.

The objects of the University Health Service are:

(1) To protect, maintain, and improve the health of students; cooperation in and follow up of entrance examination; early diagnosis and control of all communicable conditions, in cooperation with other health agencies; individual health guidance, through personal conference; first aid and casual treatment of students on the campus; periodic health examinations for seniors, food-handlers, and special cases; consultant specialist service for certain cases; full cooperation with family physician, other physicians, and health agencies;

centralized correlation of health agencies on the campus to best educational personnel ends; maintained emphasis on individual and group preventive medicine.

(2) To serve as the primary coordinating agency through centralized health records with university personnel officials in individual student health appraisal and health problems which involve the maintenance, discontinuance, or improvement of students' university relationships.

(3) To furnish a *limited degree* of hospitalization for observation, diagnosis, or treatment of emergency conditions, when in the judgment of University Health Service physicians or private physicians it is thought necessary.

Responsibility for hospital treatment or special hospital expense is not assumed by the University Health Service. The hospitalized student is under the medical or surgical care of the senior members of the hospital staff and may be charged a moderate fee for this service. The hospitalized student has his choice of a hospital staff physician.

(4) These are open to change without formal publication.

RELIGIOUS COORDINATOR

The office of the Coordinator of Religious Activities, Mr. M. D. McLean, is temporarily located in Engineering Annex A, Room 101. The telephone number is UN-3148, Ext. 601. This office serves as headquarters for all co-operative religious activities.

The offices of the Young Men's Christian Association are located on the second floor of the Student Services Building and the office of the Young Women's Christian Association is in Pomerene Hall, Room 305.

All major religious groups maintain offices in centers or Foundations. Their locations may be obtained by calling the Religious Coordinator, or by consulting the University Directory.

Students are encouraged to affiliate with the group representing their own faith.

STUDENT AUTOMOBILES

In the interest of safety and orderly traffic on the Ohio State University campus, certain regulations have been set up by the Board of Trustees.

All motor-driven vehicles driven by students, regardless of ownership, must be registered on their schedule cards in the provided space. Registration should be made at the time the student enrolls for University work each Quarter, or at the time he secures access to the car. Whether driven frequently or on infrequent occasions, car registration is required. Failure to register is subject to \$3.00 fine. A full statement of parking and traffic regulations is available at the Traffic Department in the Service Building.

Credits will be withheld at the end of the Quarter for unpaid fines or unanswered notification.

Note: Students are prohibited from parking on campus except in the following locations:

- A. Parking lot west of Baker Hall (entrance from Eleventh Avenue only).
- B. Parking lot east of Baker Hall (entrance from Eleventh Avenue only).
- B. South side of Twelfth Avenue from High Street to Baker Hall.
- C. On East side of South College Road from intersection of roads south of southeast corner of Hagerty Hall to Twelfth Ave. Drive.
- D. Parking lot north of Naval Armory (entrance from Seventeenth Avenue).
- E. Parking lots east of Stadium; not on roads leading to these lots.
- F. Parking lot south of Military Science Building.
- G. Parking lot north of Receiving Hospital.

The University seeks your cooperation in making traffic safe for the pedestrians and motorists.

ORIENTATION PROGRAM

All new students are expected to take part in a series of orientation projects which are conducted on the day or days preceding the opening of their first Quarter of residence.

A shortened program is provided for new students entering the Graduate School who are required to take the Physical Examination (by Rule 151); and also the Ohio State Psychological Examination (by Rule 152) if their graduate work is in the following departments which specifically require the test: Aeronautical Engineering, Agricultural Biochemistry, Agricultural Economics and Rural Sociology, Agricultural Education, Agricultural Engineering, Anatomy, Botany and Plant Pathology, Ceramic Engineering, Chemistry, Dairy Technology, Economics, English, Fine and Applied Arts, Home Economics, Horticulture and Forestry, Mechanical Engineering, Mechanics, Mining and Petroleum Engineering, Music, Physical Education, Physiological Chemistry, Physiology, Political Science, Poultry Science, Psychology, Sociology, Zoology and Entomology.

Ordinarily, excuses from Required Entrance Projects of the Orientation Week Program are not granted, and employed students are expected to make plans to take part in projects when the Orientation Program starts. Printed instructions will be mailed by the office handling arrangements for this program. All new students are expected to follow the instructions in this program in every detail. Tests are essential to assure places in classes and registration will not be considered complete until all *required entrance projects* have been finished. Inquiries should be addressed to Orientation Program Office, William S. Guthrie, Director, University Hall, Room 1 (campus telephone 104).

OCCUPATIONAL OPPORTUNITIES SERVICE

The Occupational Opportunities Service is a University facility established to meet the need for professional guidance to students and to provide technical service to college offices who also counsel students. It works in close cooperation with the colleges in advising students in relation to their long term educational and vocational plans. This service is available free to all students in the University at any time vocational counseling is appropriate. Tests are also administered as required by the College offices as part of their counseling program. A continuous research program is maintained for the improvement of counseling techniques and occupational information.

Students are encouraged to use the occupational library in the Occupational Opportunities Service which contains a large collection of books and pamphlets dealing with a wide range of occupations. Suggestions are also made as to seeking information from many other sources such as college deans, junior deans, college faculty or other persons who may provide additional vocational orientation to assist the individual in making the best adjustment to life.

All students are welcome to the facilities of the Occupational Opportunities Service. Counseling may be requested by any student directly or a referral may be made by a college office or by any University faculty member.

FEES AND EXPENSES

Registration is not complete until all fees have been paid. No student will have any privileges in the classes or laboratories until all fees and deposits are paid, except under special procedure authorized by the President.

Graduate students must pay their fees not later than the day before classes begin. All graduate students who have not paid their fees before 4 P. M. on the day before classes begin shall be assessed a penalty of \$1.00 for each succeeding day or fraction thereof (with a maximum of \$10.00) unless excused by the Registrar.

1. **Matriculation fee (nonreturnable)**
 Required of every student on first admission to the University\$15.00
2. **Incidental fees**
 Incidental fees do not vary with the number of courses taken
 Quarter fee for a resident of Ohio..... 45.00
 Quarter fee, including nonresident fee, for a nonresident of Ohio130.00
3. **Special fees**
 - (a) Student Services Deposit..... 5.00
 - (b) Ohio Union Building fee..... 5.00
 - (c) Laboratory deposit amounts vary with each course in accordance with approved Laboratory Deposit Schedule. Students are required to pay for all materials consumed in laboratory work. A laboratory deposit for each laboratory course must be made at the time of registration before the student may enter the laboratory. All laboratory supplies are sold to students by the Laboratory Supply Stores, McPherson Chemical Laboratory, and charged against the deposits (See page 22. Instructors shall not permit a student to engage in laboratory work unless the student has shown a receipt from the Bursar for the deposit required in the course
 - (d) **Abstract fee**
 The abstracts of Masters' theses are published in the form of a journal at the end of each Quarter and a special fee for editing, printing, and binding these abstracts is required for each person receiving such a degree from this University. This fee must be paid not later than a date which is set by the Graduate School Office for the deposit of the abstract.
 Abstracts of Masters' theses..... 10.00
 Abstracts of Ph.D. dissertations..... 40.00
 - (e) **Binding fee for theses and dissertations**
 A special binding fee must be paid to the Bursar of the University not later than a date which is set by the Graduate School office for the deposit of the thesis or dissertation 4.25

NOTE: Checks for fees will be accepted by the University but only when the check is drawn for the exact amount of the fees. When such checks are not paid on presentation at bank, registration will be automatically cancelled and receipts given considered null and void.

NONRESIDENTS

Every student who is not a legal resident of the State of Ohio is required to pay a nonresident fee of \$85.00 each Quarter (or \$43.00 either term of the Summer Quarter) of his residence in the University in addition to other University fees. The burden of registering under the proper residence is placed upon the student. If there is any possible question as to legal residence the matter should be brought to the attention of the Registrar and passed upon, previous to registration or payment of fees. Any student who registers improperly under this rule shall be required to pay not only the nonresident fee but shall be assessed a penalty of \$10.00. Students who do not pay this fee within thirty days after they have been notified that the nonresident fee has been assessed against them, will have their registration in the University cancelled.

The rules are as follows:

1. No student shall be considered eligible to register in the University as a resident of the State of Ohio unless he has had a *bona fide* domicile in the State twelve consecutive months. Domicile is established by acquiring a dwelling place and forming the intent to make the state a permanent home. This intent is not wholly to be inferred from declarations; all pertinent circumstances are to be considered. According to the privilege of voting by an election board does not conclusively establish the fact of domicile. There is a strong presumption that one who comes into the state to attend college has a temporary residence, not a domicile.

2. No student whose domicile was outside the State of Ohio in the year preceding his original enrollment in the University shall be considered a resident unless it can be clearly established by him, that his former domicile has been abandoned and a new domicile established in the State of Ohio and maintained for at least *twelve consecutive months*. No application for resident standing of one whose legal residence is not determined by that of his natural or legal guardian can be considered until the applicant is 22 years of age.

3. No student whose domicile was outside the State of Ohio at any time after his original enrollment in the University shall be considered a resident unless he has established his domicile as stated in paragraph 2.

4. MINORS. The domicile of a minor student shall be considered the same as that of his natural or legal guardian, if any, regardless of emancipation. If an Ohio resident is appointed guardian of a nonresident minor the latter shall be considered a nonresident until twelve months after such appointment.

5. WIVES. The legal residence of wives shall follow that of husbands.

6. The President will exercise his discretion as to the remission of non-resident fees in the cases of:

- a. Children of members of the United States Army, Navy, or Marine Corps, and persons who are orphans or in somewhat similar status.
- b. Nonresident minors for whom an Ohio resident has been appointed guardian.
- c. Aliens.

ROOM AND BOARD

Room and Board. (See Living Arrangements, page 29.)

RETURN OF FEES ON WITHDRAWAL

Fees are returnable in case a student withdraws on account of sickness or for other causes entirely beyond his control, if such withdrawal is made during the first thirty days of the Quarter. Students withdrawing under request from the University are not entitled to any return of fees. Permission to withdraw, given in writing by the Dean of the College, must be presented to the Bursar within this thirty-day period. Ordinarily no more than one-half of the fees paid will be refunded; if the case has exceptional circumstances it should be referred to the President for his judgment.

No fees will be returned in case of withdrawal of students until thirty days have elapsed from the date of withdrawal.

If fees are paid under mistake of law or fact they are returnable in full. Fees are not returnable except as provided in this rule.

Laboratory Deposits. If a student is forced to withdraw from a laboratory course during a Quarter, he must first secure permission from his Dean.

An order for refund for the unexpended portion of the deposit may be obtained by applying at the Laboratory Supply Store, McPherson Chemical Laboratory. The unexpended part of the deposit will be paid at the Bursar's Office on presentation of the order for refund.

SPECIAL FEE—PENALTY

PENALTY FOR FAILURE TO KEEP APPOINTMENT FOR PHYSICAL EXAMINATION

A fee of \$1.00 will be assessed for failure to keep appointment for Physical Examination or for change in date of Physical Examination.

STUDENT PERSONAL EXPENSE FUNDS

The incoming student will save himself much time and trouble by taking a few simple precautions in regard to his personal expense money. The student should bring enough cash to cover all expenses for several days. If he does not wish to carry cash, he should use travellers checks, as they are readily cashed. If he does bring a check, it should be in the form of a bank draft or cashier's check. The student who has a check should not wait until he has spent all his money before cashing the check for it may take several days to collect it. Be sure that any checks that are for the payment of fees are drawn for the exact amount of the fees.

The following facts concerning the cashing of checks should be borne in mind by parents and prospective students.

(a) The Ohio State University does not cash checks.

(b) Checks for fees will be accepted by the University, but only when the check is drawn for the exact amount of the fees.

(c) Banks do not cash checks for strangers unless the check is endorsed by a customer of the bank or some person of known responsibility. This rule applies to cashier's checks, bank drafts, and certified checks.

The student who intends to use a checking account will find that an account in Columbus will be of more value than an account at home or in some other city. An account with a Columbus bank will provide a safe place for depositing funds, will help create a local credit standing, will furnish a means of depositing and cashing checks, and will help the student to understand banking practices.

SCHOLARLY PUBLICATIONS

The Graduate Faculty is engaged both in teaching and in research. The results of its scholarly activities ordinarily appear as research papers in appropriate journals or as scholarly monographs. In order to make the results of these investigations more available, the Graduate School publishes a series of monographs and studies in different fields of learning. A manuscript is considered for publication on the basis that it contains new and original work. In exceptional cases the results of research work done by graduate students may be accepted for publication as a monograph or study. The University Library uses these publications as a basis of exchange for publications from other universities. A complete list of those already published or in press may be had on application to the Office of the Graduate School.

ASSISTANTSHIPS, FELLOWSHIPS, AND SCHOLARSHIPS

GRADUATE ASSISTANTSHIPS OPEN TO GRADUATE STUDENTS

In order to encourage graduate students to continue their studies and to pursue advanced work leading to the higher degrees, the University has established graduate assistantships in several departments. Graduate assistants must be registered in the Graduate School as candidates for a graduate degree. They are elected for the year—four Quarters. During three Quarters, generally the Autumn, Winter, and Spring Quarters, they must devote approximately one-third of their time to assisting in the work of the department in

which they are specializing; during the remaining Quarter the graduate assistants are free to carry on their work at the University or elsewhere. Each graduate assistant must confer with the chairman of the department in which he is specializing concerning the Quarters that he must be in residence. The maximum stipend for graduate assistants is \$900 payable in nine monthly installments during the three Quarters in which he is rendering service. In addition, all fees are remitted except a matriculation fee of \$15.00. If a graduate degree is obtained, the assistant must pay a fee for editing and printing the abstract of his thesis or dissertation and for binding the thesis or dissertation (\$14.25 in the case of the Master's degree and \$44.25 in the case of the degree of Doctor of Philosophy).

Students desiring to apply for graduate assistantships in any academic year *must present their applications not later than March 1 of the preceding year*. Application blanks may be obtained upon request by addressing the chairman of the department in which the candidate desires to secure such an assistantship.

UNIVERSITY SCHOLARSHIPS AND FELLOWSHIPS

In addition to the graduate assistantships, a limited number of scholarships and fellowships have also been established. The scholarships are open to students having a baccalaureate degree from an approved institution, and have a value of \$600 to \$800 with exemption from all fees, except the matriculation fee of \$15.00. The fellowships, on the other hand, are open only to students who have at least the Master's degree or its equivalent, and have a value of \$1,000 with similar exemption from fees. (This exemption from fees amounts to \$165.00 for residents of Ohio and \$420.00 for nonresidents of Ohio for the academic year.) If a graduate degree is obtained, a scholar or a fellow must pay a fee for editing and printing the abstract of his thesis or dissertation and for binding the thesis or dissertation (\$14.25 in the case of the Master's degree and \$44.25 in the case of the degree of Doctor of Philosophy). These awards are limited to applicants under thirty-five years of age.

Scholars and fellows are selected on a basis of merit, irrespective of the departments in which they wish to specialize, and *must devote all their time to graduate work, including research*. Scholars and Fellows must carry a schedule of fifteen Quarter hours of graduate work each Quarter and they may not accept employment of any kind. They are elected for the year, four Quarters, but are required to be in attendance only three Quarters, generally the Autumn, Winter, and Spring Quarters, during the year. Candidates for these positions for the year 1955-1956 must file their applications not later than February 15, 1955. Application blanks may be obtained by addressing the Dean of the Graduate School. Appointments are announced annually on April 1 in accordance with the regulations of the Association of American Universities, of which Association the University is a member.

NONRESIDENT TUITION SCHOLARSHIPS

Each year the Graduate School offers fifty nonresident tuition scholarships, available to entering graduate students who are not residents of Ohio. These scholarships provide for the remission of the nonresident incidental fee of \$85.00 a Quarter and, therefore, carry a stipend which is equivalent to \$255.00 a year. The regular incidental resident fee must be paid just as though the student were a resident of Ohio. These scholarships are awarded only to students of outstanding ability. Applications should be accompanied by a transcript of record of undergraduate and graduate work (if any), letters of recommendation from those familiar with the applicant's work and any other available evidence

of ability and achievement. Candidates for these nonresident tuition scholarships should apply to the Dean of the Graduate School for application forms and submit them not later than April 30.

POST-DOCTORAL FELLOWSHIPS AND SCHOLARSHIPS

Post-doctoral Fellows and Scholars are not permitted to work toward graduate degrees.

UNIVERSITY POST-DOCTORAL FELLOWSHIP

A University Post-doctoral Fellowship will be available for the year 1955-1956. This Fellowship is for research work in any area on the campus. It carries a stipend of \$3,600 for a nine months' period. The holder must have a doctoral degree or its equivalent and is required to devote all his time to research. Applications must be filed by March 1 on application blanks obtained from the Graduate School Office.

THE ELIZABETH CLAY HOWALD SCHOLARSHIP

This scholarship, endowed by the late Ferdinand Howald, an alumnus of The Ohio State University, in memory of his mother, Elizabeth Clay Howald, at present carries a stipend of \$3,600 payable in twelve monthly installments.

Any person who has shown marked ability in some field of study and has in progress work, the results of which promise to constitute important additions to our knowledge, shall be deemed eligible to appointment to this Scholarship.

The scholar will be expected to devote his time uninterruptedly to the pursuit of his investigations. If he has ever been a student of The Ohio State University or a member of the University staff, he may carry on his investigations either at The Ohio State University or, subject to the approval of the Graduate Council, elsewhere either in this country or abroad where superior advantages for his particular field of study are available. If the scholar has never had any connection with The Ohio State University, however, then he must carry on his investigations at The Ohio State University.

Applications must be filed with the Dean of the Graduate School not later than March 1. The appointment will be made in April and the term of appointment will begin July 1 and extend to June 30 of the following year.

Prospective candidates may secure application blanks by addressing the Dean of the Graduate School.

THE MARY S. MUELLHAUPT SCHOLARSHIPS

These scholarships, which were endowed by the late Mrs. Mary S. Muellhaupt of Portland, Oregon, are granted annually to the candidates who are considered most likely to promote, by original research, one of the biological sciences, particularly botany, bacteriology, physiology and zoology. They carry annual maximum stipends of \$4,500, depending on the qualifications of the recipients.

Anyone who has recently completed the requirements for the Ph.D. degree or who has training equivalent to this degree, as shown by publications, shall be eligible for appointment to these scholarships.

The holders of these scholarships must devote their entire time to research for a period of one calendar year from the date of appointment with one month for vacation. If the Scholar has had previous connection with The Ohio State University he may carry on his research work away from the University provided superior facilities are available.

Applications should be accompanied by publications and other supporting evidence of research experience, as well as a plan of the research proposed under the scholarship. They must be filed with the Dean of the Graduate School not later than March 1.

Prospective candidates may secure application blanks by addressing the Dean of the Graduate School.

ENDOWED FELLOWSHIPS AND SCHOLARSHIPS

All endowed Fellowships and Scholarships carry the same remission of fees as do University Fellowships and Scholarships. (See page 24.)

THE FREDERICK HILLIS LUMLEY MEMORIAL FELLOWSHIP

Mr. and Mrs. Frederick E. Lumley, in memory of their son, have created the Frederick Hillis Lumley Memorial Fund in experimental and theoretical psychology. From the income of this fund a fellowship or scholarship in experimental or theoretical psychology will be created by the committee in charge of the fund; or at the discretion of this committee, the income from the fund may be spent for publication of work done at The Ohio State University in the fields mentioned above, or for such other aid in furthering important research in the field as the committee may approve.

THE STILLMAN W. ROBINSON FELLOWSHIP

The fellowship endowed by Stillman W. Robinson, late Professor of Mechanical Engineering, for the encouragement of graduate research in engineering, has an annual value of \$1,000, and is open to graduates in Mechanical, Civil, and Electrical Engineering.

The holder of the fellowship must devote his entire time to graduate work. This should lead to the Master's or the Doctor's degree under the general regulations which obtain in reference to these degrees. For further information, or for application blanks, address the Dean of the Graduate School or the Secretary of the College of Engineering.

All applications should be filed with the Dean of the Graduate School not later than February 15.

THE NATHANIEL WRIGHT LORD FELLOWSHIP

The fellowship endowed by William Bartlett Calkins, an alumnus of the University, in memory of Nathaniel Wright Lord, late Professor of Metallurgy, has an annual value of \$1,350. This fellowship was established to encourage graduate research on solid fuels or products derived from solid fuels which have a practical application in the industrial world. Research on other subjects in the general field of metallurgy may be pursued also under this Fellowship.

The holder of the fellowship must devote his entire time to graduate work. This should lead to the degree of Master of Science or Doctor of Philosophy, under the general regulations which obtain in reference to these degrees. For further information or for application blanks address the Dean of the Graduate School.

All applications should be filed with the Dean of the Graduate School not later than February 15.

EDWARD ORTON JUNIOR CERAMIC FOUNDATION FELLOWSHIP

Under the provisions of the will of the late Edward Orton, Jr., the Edward Orton Junior Ceramic Foundation has established a fellowship having an annual value of \$1,200. Of this amount \$1,000 is the stipend of the Fellow and \$200 is used for the purchase of apparatus and materials. The candidates are nominated by the Department of Ceramic Engineering and the proposed research problems are to be approved by the Research Committee of the Edward Orton, Jr. Ceramic Foundation. The research is to be done in the field of "kiln fired ceramics." The holders of these fellowships are expected to devote their entire time to graduate courses and research work in ceramic engineering and technology under the general direction of the Department of Ceramic Engineering and ordinarily will be candidates for either the Master of Science or the Doctor of Philosophy degree. At least twenty hours per week should be used for the research problem.

THE JOHN A. BOWNOCKER FELLOWSHIP AND SCHOLARSHIPS

A fellowship and one or more scholarships may be provided from funds bequeathed by John A. Bownocker, an alumnus of the University and late Professor of Geology. The fellowship, which is open only to students who have done at least one year of graduate work, has an annual value of \$1,000. A scholarship has the annual value of \$800 and may be awarded to a beginning graduate student who has demonstrated outstanding ability.

The holder of a John A. Bownocker Fellowship or Scholarship must register in the Graduate School of The Ohio State University and must devote his entire time to graduate work and research in the field of geology. This should lead towards a graduate degree under the general regulations which obtain in reference to these degrees. For further information, or for application blanks, address the Dean of the Graduate School.

All applications must be filed with the Dean of the Graduate School not later than March 1.

ALBERTA GARBER SCOTT FELLOWSHIP

The Alberta Garber Scott Fellowship has a value of \$600 for a nine-month period, and is open only to Seniors in The Ohio State University who expect to receive the baccalaureate degrees before October 1, 1955. The holder of this Fellowship is expected to devote his entire time to graduate courses and research in the field of political science, social administration, or sociology and must be a candidate for the Master's or Doctor of Philosophy degree.

Application blanks may be secured by addressing the Dean of the Graduate School. All applications should be returned not later than February 15.

SPECIAL FELLOWSHIPS AND SCHOLARSHIPS**THE BATTELLE MEMORIAL INSTITUTE FELLOWSHIPS**

The Battelle Memorial Institute of Columbus has established one or more fellowships at The Ohio State University. Each fellowship carries an honorarium of \$1,200 for a nine-month period. All course work selected by the fellow will be taken at The Ohio State University, while the research work will be carried on at The Battelle Memorial Institute. Inasmuch as this Institute was founded for the purpose of studying the application of science to industries, especially in metallurgy, fuels and allied fields, the candidate's research work must be in this general field. Each fellow will be a candidate either for the degree of Master of Science or Doctor of Philosophy, and will devote his entire time to graduate work, including research.

Candidates may secure application blanks by addressing the Dean of the Graduate School. All applications should be received not later than February 1 of each academic year.

THE MARGARET G. HARDER PAN-AMERICAN SCHOLARSHIP

In May, 1930, the Ohio Federation of Women's Clubs established a scholarship to be known as the Margaret G. Harder Pan-American Scholarship. This scholarship carries an honorarium of \$800 payable in monthly installments, and in addition the holder of the scholarship is allowed the same exemption of fees as are the University Scholars and Fellows.

The scholarship is open to women graduates of reputable South American Colleges and Universities. For further information concerning this scholarship address Mrs. William N. Harder, 434 East Church Street, Marion, Ohio.

THE PROCTER AND GAMBLE FELLOWSHIP

This Fellowship, established by the Procter and Gamble Company, has an annual value of \$1,200. This fellowship was established to encourage graduate work in the field of chemical engineering and is open to graduate students in the Department of Chemical Engineering. The holder of this Fellowship must

devote his entire time to graduate work leading to the degree of Doctor of Philosophy. Candidates may secure application blanks by addressing the Chairman of the Department of Chemical Engineering. Applications should be filed not later than March 1.

FOUNDRY EDUCATIONAL FOUNDATION SCHOLARSHIPS

The foundry industry contributes the sum of \$5,000 each year to the University to be used for scholarships and fellowships. The scholarships, normally \$300 each, are granted to fourth and fifth year students in the Foundry Option (Department of Industrial Engineering) while fellowships, normally \$1,200 each, are granted to graduates in engineering who wish to earn advanced degrees in Foundry Technology. Applications for these scholarships and fellowships must be made through the office of the Department of Industrial Engineering on or before May 10 each year.

OTHER FELLOWSHIPS

A number of fellowships are established each year by various organizations and societies for one year only, for the purpose of carrying on research work in definite fields of investigation.

SPECIAL PRIVILEGES TO DOCTORS OF PHILOSOPHY AND OF SCIENCE

The privilege of attending lectures and seminars and of carrying on research in the laboratories and libraries is extended by the President of the University, on the recommendation of the chairman of a department and the Dean of the Graduate School to Doctors of Philosophy or Doctors of Science or to scholars with an established reputation. Such Visiting Fellows may not take courses for credit but are expected to devote their time to some form of scholarly work. There will be no charge and no compensation from the University. Those desiring to avail themselves of this privilege should correspond with the chairman of the department in which they are interested or with the Dean of the Graduate School before the opening of the Quarter in which they desire to be in residence at the University.

WOMEN GRADUATE RESIDENTS

Several women students will receive stipends of from \$20.00 to \$60.00 a month for nine months of the year and room and board as Graduate Residents in Women's Residence Halls. In return they give twenty-five hours a week to duties under the direction of the Head Resident. They pay their own tuition and other fees. They cannot take any additional paid work. More detailed information will be furnished on request.

One Graduate Resident in the W.S.G.A. Cooperative Club has the opportunity to materially reduce her room and board expenses by taking part in this cooperatively-operated residence for upper division students.

Upon application from any sorority, the Board of Trustees will grant free tuition to Graduate Residents for whom the sorority offers a fellowship covering room and board. In return the Graduate Resident cooperates with the Dean of Women in helping the members of the sorority as an older adviser.

Applications for all of the above three kinds of positions should be made before April 1.

LIVING ARRANGEMENTS

The President of the University has the authority to supervise living arrangements of students not residents of the city of Columbus and to order the immediate withdrawal of any student from any boarding or lodging house in which the surroundings are undesirable.

MEN'S HOUSING

The Stadium Dormitories offer to 620 men low-cost board and room.

The River Road Dormitories provide housing facilities (double and single rooms) for an additional 600 men. One building of these dormitories has been designated as a graduate building for graduate students only. Cafeteria service is available at reasonable rates.

Applications for either of the above accommodations may be made through the office of either dormitory or the Office of the Dean of Men, Room 108, Administration Building.

Furnished rooms in private homes in the city of Columbus provide housing for a greater part of the men students. The rates vary from \$25.00 to \$35.00 a month for single rooms; \$20.00 to \$25.00 for double rooms (per student). One should visit Columbus three to four weeks prior to entrance to choose a suitable room. A listing of available rooms will be found in the Office of the Dean of Men.

BOARD

Board for students is available at a Quarterly rate at Pomerene Refectory. Cafeteria food service is also available at Pomerene Refectory and Ohio Union.

Dormitory meal service is furnished at the Stadium Dormitories for men and at Baker Hall for women.

MARRIED STUDENTS

Housing for married students constitutes one of the University's most difficult problems. While 350 married veterans will be housed in the family units in the River Road Project, the greater number of married couples must find living quarters in the city of Columbus. Listings of houses and apartments available for rent are posted in the Dean of Men's Office.

THE GEORGE WELLS KNIGHT INTERNATIONAL HOUSE

The George Wells Knight International House, 104 Fifteenth Avenue, offers desirable living quarters to a limited number of foreign and American students. Applications should be made to the Director of Men's Housing within the Dean of Men's Office, 108 Administration Building.

MEN'S FRATERNITIES

A large number of men enjoy the advantages of living together in fraternity homes. These Greek letter organizations have for many years maintained establishments which provide excellent rooming and boarding arrangements. They meet the same standards of inspection that are required of the approved houses and are approved as an integral part of the University's housing arrangements. Prospective students who are interested in possible membership should write to the Dean of Men.

WOMEN STUDENTS

The Ohio State University is open to women upon the same conditions and by the same methods of registration offered to men. Every woman student, whether undergraduate or graduate, must register with the Dean of Women at her office in Pomerene Hall during the first week of each Quarter.

LIVING ARRANGEMENTS FOR WOMEN

All living arrangements for women are under the supervision of the Dean of Women. Women students should apply to the Dean of Women for housing accommodations when making application for admission to the University.

Housing cannot be arranged by correspondence. Students must consult with the Dean of Women or her assistant in person for housing accommodations.

OTHER ARRANGEMENTS

A limited list of rooms in private homes is available for graduate women at the Office of the Dean of Women. There are also a very few light housekeeping rooms and apartments reported to the Dean of Women and available for the inspection of graduate women. Graduate women are not permitted to live in any house where there are men roomers.

FOR FURTHER DETAILED INFORMATION

Booklets and other sources of information about the various kinds of living quarters will be gladly and promptly sent to any one who inquires. Such information will include detailed descriptions of the halls of residence and houses as well as prices for the various types of accommodation. Address requests for booklets to The Dean of Women, Pomerene Hall, The Ohio State University, Columbus 10, Ohio.

ADMISSION

METHOD OF ADMISSION

The admission of students is in charge of the University Entrance Board, which determines the credits that shall be issued on all entrance examinations and certificates, and furnishes all desired information to applicants. Correspondence relating to admission to the Graduate School should be addressed to the University Examiner, The Ohio State University, Columbus 10, Ohio.

REQUIREMENTS FOR ADMISSION

Admission to the Graduate School is open to graduates of colleges and universities of approved standing, *provided their undergraduate records are satisfactory*. For an undergraduate record to be satisfactory in the sense of qualification for admission to the Graduate School it must show at least a 2.5 average in all the undergraduate work counted toward a baccalaureate degree and at least a 2.7 average in the undergraduate major. Before entering upon graduate work in any department, the applicant must present evidence to the effect that he has had the necessary prerequisite training that will enable him to pursue with profit the courses desired. *It must be remembered also that admission to the Graduate School does not imply admission to candidacy for a degree*. No graduate student shall be admitted to candidacy for a degree until he has been in residence a sufficient time to enable his instructors to judge of his ability to carry on graduate work.

Information concerning admission to candidacy will be found under the headings "Requirements for the Degrees of Master of Arts and Master of Science" and "Requirements for the Degree of Doctor of Philosophy."

Graduate students must register for at least one graduate course in order to maintain registration during any Quarter.

GRADUATE RECORD EXAMINATIONS

If the University Examiner deems it necessary, he may require entering graduate students to take the Graduate Record Examination. These examinations, which require no special preparation, give valuable evidence of a student's qualifications for graduate work, afford a convenient and effective method of presenting evidence of independent study or exceptional achievement, and are very helpful in planning courses of graduate study. Information about them may be secured from the Office of the Registrar. A fee of \$10.00 is charged.

CLASSIFICATION OF GRADUATE STUDENTS

Graduate students are classified in two groups as follows:

Regular Graduate Students. Students in this group are those who wish to work toward a graduate degree at The Ohio State University. A program of study will be outlined for a regular graduate student at the time of his first registration in the Graduate School. After consultation with an adviser or a departmental committee on graduate study, the status of regular graduate students will be determined as completely as possible and conditions for candidacy for the appropriate degree will be specified.

Special Graduate Students. Students in this group are those who are not working toward an advanced degree but wish to elect work with a special purpose in view. Such students must comply with all the regular requirements for admission to the Graduate School. Their courses of study may be arranged with maximum freedom. Any course announced for advanced undergraduate students and for graduate students is open for election by a Special Student under the same conditions as those imposed upon students who are candidates for degrees. The same standards of accomplishment are required of special students as of those working toward advanced degrees. Special students will not be permitted to register for thesis or dissertation work nor will they be permitted to take the foreign language examinations for the Master's or the Doctor of Philosophy degree.

Should a Special student subsequently desire to become a candidate for a degree, the amount of credit he is to receive for work already completed will be determined by the department in which he expects to specialize and he must satisfy all the departmental requirements necessary for admission for the degree he seeks.

VETERANS

The United States Veterans Administration has approved The Ohio State University as an institution for training under Public Laws 16 and 894 (Vocational Rehabilitation Acts), Public Law 346 (Servicemen's Readjustment Act of 1944), and Public Law 550 (Veterans' Readjustment Assistance Act of 1952). The University, accordingly, encourages the enrollment of demobilized students and offers its facilities to those qualified for attendance to the full extent of its accommodations in each of its colleges and schools. The rules for admission and continued registration for demobilized students are, in general, the same as those for other students.

The regional office of the Veterans Administration located in Cincinnati, Ohio, has charge of training in Columbus. Veterans desiring information relative to their eligibility under laws relating to veterans should contact the Regional Office of the Veterans Administration in Cincinnati, Ohio, or the Contact Office, 48 Starling Street, Columbus, Ohio.

Veterans who have been approved for a period of training under the provisions of the Public Law 346 should complete their admission and arrange their schedules in the college of their choice in the manner outlined in this bulletin. Upon receipt of the approved schedule and fee card, these cards, together with the Certificate of Eligibility for training issued by the Veterans Administration, should be presented at the Veterans' Center, Administration Building. There the student will be enrolled as a trainee, and the payment of fees and the issue of books and supplies will be arranged. The Liaison Representative will notify the Veterans Administration of the commencement of training in order that checks covering the subsistence allowance may be sent to the student.

The Servicemen's Readjustment Act, as amended, provides that a course of education or training shall be initiated before the termination of four years after the date of discharge or by July 25, 1951, whichever is the later, and

that such education or training cannot be afforded beyond July 25, 1956, except for those veterans who enlisted under the Voluntary Recruitment Act of October 6, 1945. Therefore a veteran otherwise eligible must have commenced and actually be pursuing his course of education or training on July 25, 1951, or the date four years after discharge, whichever is later, except where his attendance is interrupted because of the normal interruptions for summer vacations, or other reasons beyond the control of the veteran.

Each veteran who desires to attend Ohio State University under Public Law 550 should apply to the Veterans Administration for a Certificate of Education and Training. At the same time he should proceed with his registration in the University in the same manner as any regular student. After the veteran's registration in the University has been completed and his fees have been paid, he should bring his PAID fee card, schedule card, and Veterans Administration Certificate for Education and Training to the Veterans' Center, lobby of the Administration Building. Instructions will be given there concerning the required monthly certificates to the Veterans Administration.

Particular attention is called to the following statement from the Veterans Administration Regional Office. "The Veterans' Readjustment Assistance Act of 1952, Public Law 550, 82nd Congress, provides that a veteran must actually commence an active pursuit of an approved program of training prior to August 20, 1954, or within two years of his discharge date, whichever is the later date. He must be in actual pursuit of his program on this delimiting date, except where his attendance is interrupted for normal summer vacations or for other reasons deemed by the Veterans Administration to be beyond his control; and except that he may suspend pursuit of his program for a period or periods of not more than 12 consecutive months in length. This law also provides that no education or training shall be afforded a veteran beyond a date 7 years following the end of his basic service period."

METHOD OF PROCEDURE FOR ADMISSION

An applicant for admission to the Graduate School must first secure a statement from the registrar or other officer of the university or college of which he is a graduate, which contains the following information: (1) the date of graduation of the applicant; (2) the degree received; (3) a complete list of courses taken and grades received. This transcript, together with a catalogue of the institution of which the applicant is a graduate, should be sent to the University Entrance Board not later than three weeks (an earlier date is preferable) before the opening of the Quarter in which the applicant expects to register. If the credentials are satisfactory, an admission card to the Graduate School will be mailed promptly to the applicant. If the credentials are not satisfactory or if further information is desired, the applicant will be notified at once by correspondence.

REGISTRATION

METHOD OF PROCEDURE FOR REGISTRATION

The method of procedure for registration is as follows: The student, having secured from the University Entrance Board his admission card to the Graduate School, will present this card at the Office of the Graduate School in Room 309, Administration Building. Here he will be given a course of study card and will be instructed as to the further method of procedure for registration. This procedure will include the selection of an adviser by the department of instruction, who will assist the student in mapping out a suitable course of study. The adviser will signify his approval of the course of study by signing the card in the appropriate place. The courses having been entered upon the

course of study card, the student will then return the card to the Office of the Graduate School where his schedule card will be approved. The student then will immediately report to the Registrar's Office in the Administration Building and obtain his fee card. He will then pay his fees at the Office of the Bursar in the Administration Building. *Registration is not complete until the fees have been paid.* Even a student who for any reason is exempt from payment of fees, must report to the Bursar's office and have his fee card stamped. All fees and laboratory deposits required by a student must be paid to the Bursar before the student is entitled to enter his classes.

A change in the student's adviser is reported to the Office of the Graduate School.

CHANGES IN COURSE

After a student's course of study card has been made out, changes in his course of study will be made only upon the written request of the student's adviser. This written request must be presented by the student *in person* at the Office of the Graduate School. No credit will be given on the University records for courses taken without the proper authorization.

DATE OF REGISTRATION

Graduate students may register during an early registration period which begins about one month after the opening of the previous Quarter. This period is approximately three weeks long. The final registration period begins ten days to two weeks prior to the end of the previous Quarter. Registration is also permitted during the week between Quarters. All students must be registered not later than the day before classes begin, as elsewhere in the University. Students from out of town should write for appointment in the department of instruction before coming to register during the vacation periods between Quarters, since it is not possible to register without the approval of the department in which the student is specializing.

AUDITING COURSES

Regularly registered students may audit courses with the written permission of the instructor in charge of the course or courses. Such courses must be officially entered upon the schedule of the student. Cards for this purpose may be obtained from the Office of the Graduate School. Signed audit cards must be presented in person at the Graduate School Office not later than the end of the first week of the Quarter.

Students registering as auditors must complete their registration not later than the day before classes begin.

WITHDRAWAL FROM COURSES

After registration is completed, the student must report at the Office of the Graduate School in order to withdraw officially from any course; otherwise he will be marked "Failed" in the course from which he withdraws. After the first four weeks of the Quarter, the instructor's written permission is necessary if withdrawal from a course is requested. This permission must include a statement of the quality of the work being done by the student in the course. Withdrawal from courses will not be permitted after two weeks prior to the beginning of final examinations.

WITHDRAWAL FROM THE UNIVERSITY

A student who desires to withdraw from the University must apply to the Dean of the Graduate School for permission to withdraw in good standing. *If the student leaves the University at any time during the Quarter, without communicating with the Dean, he will be marked as having failed in all of his courses for the Quarter.* If a personal interview is impossible, the Dean must

be notified by mail. After the first four weeks of the Quarter the student must obtain written permission from the instructors in charge of his courses if he wishes to withdraw. These permissions must include statements of the quality of scholastic work being done at the time of withdrawal. No withdrawal from the University will be permitted after two weeks prior to the beginning of final examinations.

STUDENTS TRANSFERRING TO A COLLEGE IN THE UNIVERSITY

A student who desires to transfer from the Graduate School to a college of this University must make his application for such transfer to the University Examiner. This transfer must be approved by the University Examiner before the student will be permitted to proceed with his registration in the college which he is proposing to enter.

COMBINATION ARTS AND SCIENCES-GRADUATE COURSE LEADING TO THE BACHELOR OF ARTS AND MASTER'S DEGREES

In accordance with an agreement made between the College of Arts and Sciences and the Graduate School, it is possible for students of exceptional ability to secure both the Bachelor of Arts and Master's degrees by an extra Quarter of study in addition to the regular four-year period ordinarily required for the degree of Bachelor of Arts. Indeed, by the proper planning of the sophomore and junior schedule of study, it is even possible to secure both of these degrees in four years.

Admission to the Combination Arts and Sciences-Graduate course is limited to those students in the College of Arts and Sciences who have completed all junior division requirements and at least one hundred and forty-five Quarter hours of work with a point ratio of not less than 3.5.

Students who are eligible and wish to apply for admission to this combination course must do so as soon as they have finished the junior requirements. Such students should report to the office of the College of Arts and Sciences for detailed information as to method of procedure.

COMBINATION ENGINEERING-GRADUATE COURSE LEADING TO THE BACCALAUREATE DEGREE IN ENGINEERING AND THE MASTER OF SCIENCE DEGREE IN FIVE YEARS

In accordance with an agreement made between the College of Engineering and the Graduate School, it is possible for qualified students in engineering to secure both a baccalaureate degree in engineering and a master's degree in five years.

An engineering student registered in the five-year curriculum whose general point average is 2.75 at the end of his third year may, upon his own application, be admitted to the master's degree program. A student so admitted may take approximately fifteen hours of his graduate program in the fourth year on senior petition. Courses taken on senior petition in which the grade "C" is received will not be counted in the total hours required for the Master's degree but the "C" grade will be counted in determining the point-hour ratio in the Graduate School.

He must maintain double registration in the College of Engineering and Graduate School during the fifth year. During the fifth year he must complete the remainder (approximately thirty Quarter hours) of his program for the master's degree, meeting all the graduate requirements for that degree. Not less than fifteen Quarter hours, including thesis, must be taken in courses open only to graduate students. The Graduate-Engineering Advisory Committee must approve the student's program at the beginning of the fourth year and again at the beginning of the fifth year.

A student in this double program who does not complete the requirements for the Master's degree at the same time he receives his baccalaureate degree, must complete the work for the Master's degree within a period of twelve months after the date upon which he receives his baccalaureate degree or the graduate credit he has accumulated will be cancelled.

In order for a student to be admitted to the Graduate School at the beginning of the fifth year, he must satisfy the normal requirements for such admission.

CONCURRENT REGISTRATION IN PROFESSIONAL COLLEGES AND THE GRADUATE SCHOOL

A student who is registered in the College of Dentistry, the College of Law, the College of Medicine, the College of Pharmacy, or the College of Veterinary Medicine of this University and who also wishes to enroll for graduate study may be registered concurrently in the Graduate School if he has the proper qualifications for entrance. To secure this concurrent registration the student must first obtain from the University Examiner an admission card to the Graduate School.

When a student is registered concurrently in the Graduate School and in the College of Dentistry, the College of Law, the College of Medicine, the College of Pharmacy, or the College of Veterinary Medicine of this University, he may count not more than fifteen hours of professional course work toward the Master's degree and not more than thirty Quarter hours of such work toward the Ph.D. degree. These professional courses must be listed in the Bulletin of the Graduate School in order to be used as credit toward a graduate degree. Each professional college has an advisory committee which shall approve the program of graduate work proposed by each candidate for admission to the double curriculum. The approved program must be submitted to the Dean of the Graduate School for approval before the student begins his graduate work.

DEGREES CONFERRED

The following higher degrees are conferred by the University: Master of Arts, Master of Science, Master of Education, Master of Business Administration, Master of Social Work, Master of Science in Public Administration, Master of Dental Science, Master of Medical Science, Doctor of Philosophy. The requirements for the Master's degree will be found on pages 38 to 45 and for the degree of Doctor of Philosophy on pages 45 to 49. All candidates must read these requirements carefully.

REGISTRATION DURING THE QUARTER IN WHICH THE DEGREE IS SOUGHT

A candidate for any graduate degree must be registered in the Graduate School during the Quarter in which he expects to come up for the degree.

GRADING SYSTEM FOR GRADUATE STUDENTS

The work of graduate students performed in connection with the development of theses and dissertations may be reported simply as "Prog" indicating progress until the work is completed when a final letter grade will be reported. All other work is reported as "A" Excellent, "B" Good, "C" Average, "D" Poor, "E" Failed, "E abs." Failed Absent. "D," "E," and "E Abs." grades do not carry graduate credit.

In computing point-hour ratios A=4 points, B=3, C=2, D=0, E=0, E. Abs.=0. Courses in which the grade "E" is received may be repeated; courses in which the grade "D" is received may be repeated with the written

permission of the Dean of the Graduate School. However, in all such cases the original "D" or "E" grade will be counted in determining the point-hour ratio of the student, as well as the grade received when the course is repeated.

Occasionally, for various reasons, a graduate student may receive a grade of "Incomplete" in a course with the privilege of finishing the work later on. In all such cases, however, this "Incomplete" must be made up not later than the end of the first Quarter of registration after the close of the Quarter in which the "Incomplete" was received, or he will receive a "Failure" in the course.

A student who receives one or more "Incomplete" grades during a Quarter must reduce his schedule for the following Quarter by the number of hours "Incomplete" received.

The grade "Progress" shall be used to indicate that individual work of a satisfactory quality has been done in research, minor problems, or seminar courses scheduled to continue for at least two Quarters. Credit hours of work graded as "Progress" shall be indicated on the report card to the Registrar. A letter grade must replace the grade "Progress" when the work is completed, except in 950 in which case a single final grade may be given and this grade will apply to all Quarters of 950. The grade "Progress" shall not be used in place of the grade "Incomplete" in courses or seminars where the work is scheduled to be completed in one Quarter.

A graduate student who is registered in a "600" or "700" course carrying graduate credit is required to complete a certain amount of work in addition to that required of undergraduates. This may consist of reading additional books on the subject and presenting a review of same, the presentation of reports, or of such other work as the instructor in charge of the course may deem wise.

TOTAL CREDIT THAT MAY BE RECEIVED IN ANY ONE QUARTER

A graduate degree stands for concentration in a limited field of study. *No graduate student may receive credit toward a graduate degree for more than fifteen hours in any one Quarter or more than eight hours of graduate credit for work taken during a term of one Summer Quarter or fifteen hours for two terms.*

CREDIT HOURS FOR PART-TIME ASSISTANTS AND INSTRUCTORS

The maximum credit toward a graduate degree that may be obtained in any one Quarter (a) by a graduate assistant is twelve hours, (b) by an assistant, ten to twelve hours depending on duties, (c) by an instructor, eight hours, and (d) by an assistant instructor, eight to ten hours depending on his teaching load. The maximum credit that may be obtained by students holding positions other than those named above will be decided in each case by the Dean of the Graduate School.

GRADUATE CREDIT FOR UNDERGRADUATES

An undergraduate student who has completed three years of work and whose full time is not required for the completion of work for his baccalaureate degree, may select certain courses for graduate credit provided his cumulative point hour ratio is 2.75 or above. He must obtain permission at the Office of the Graduate School before registering for the courses. A grade of "B" or better must be received in such courses in order to obtain graduate credit. A student who meets these requirements and petitions for graduate credit cannot use this as graduate credit until he is admitted to the Graduate School and until the department in which he wishes to specialize accepts the work as applying on his graduate program. Not more than fifteen Quarter hours of such work may be counted toward an advanced degree under any circumstances.

GRADUATE WORK IN THE SUMMER QUARTER

Since The Ohio State University is organized on the four Quarter system, it is possible for graduate students to complete a full Quarter of work during the summer.

For the benefit of those who cannot always stay during the entire Summer Quarter, this Quarter is divided into two equal terms. At least one continuous Quarter of residence must be included in the residence requirement of three Quarters for the Master's degree. The remaining work for this degree may be taken in Summer Terms or by registration during Summer Terms and the completion of a certain amount of satisfactory *ad interim* work under the direction of one or more members of the instructional staff of the department in which the student is specializing. *Ad interim* work must be taken between Summer Terms or Quarters and no student may receive the Master's degree during a Quarter in which he is registered for *ad interim* work. The amount of such work that will be credited towards any advanced degree is limited to twelve Quarter-hours and the amount during any one *ad interim* period to six Quarter-hours. *Ad interim* work is limited to candidates for the Master's degree.

No student is allowed to pursue *ad interim* work unless he has been in residence in the Graduate School of this University at least one term of a Quarter. Moreover, it is optional with any member of the instructional force as to whether or not he will supervise such work.

A student who wishes to pursue *ad interim* work will proceed as follows: Before the close of the Summer term or Quarter in which he is in residence he will obtain from the Office of the Graduate School an appropriate card and, after consultation with the professor in charge of the proposed *ad interim* work, will enter upon this card a brief outline of the work to be pursued in the *ad interim* period. After securing the signature of the professor thus signifying his willingness to conduct the proposed *ad interim* work, the student must deposit this card in the Office of the Graduate School *before* the close of the Summer Quarter. As an evidence of earnest intentions, he must also register in the University (this does not imply attendance) for at least one Quarter of each period during which the *ad interim* work is being pursued. He is also required to report to the professor conducting his work at least once a month and to pass such examinations as may be prescribed. He may borrow from the University Library such books as may be necessary for the successful conduct of the work, but will be required to pay for the cost of shipment. Requests for such books should be sent to the Dean of the Graduate School.

OFF-CAMPUS RESEARCH WORK

A student employed outside Columbus who desires to carry on off-campus research work in connection with his dissertation must have his program approved in advance by his adviser and by the Dean of the Graduate School, must maintain his registration in the Graduate School, and must pay the regular residence fees during each Quarter for which he desires credit. No student may carry off-campus research work unless he has been in residence in the Graduate School of this University for at least one Quarter. Not more than five Quarter hours of credit may be obtained during each Quarter of registration for off-campus research and not more than six Quarters of off-campus research work may be applied toward the Ph.D. degree. Graduate students working toward the Master's degree may not register for off-campus research.

THESES, DISSERTATIONS AND RESTRICTED RESEARCH

Manuscripts on subjects or containing material preventing unrestricted publication may not be presented as theses or dissertations. However, if pub-

lication is restricted for reasons of national security, after precautions have been taken to avoid restricted publication, the student's adviser and the department chairman shall immediately present a statement of the circumstances to the Executive Committee for whatever action it considers appropriate.

INTERDEPARTMENTAL DEGREE PROGRAMS

The Graduate School recognizes the importance of programs of study and research which lie on the borderland between two or more recognized fields of learning in such a way that they cannot be easily assigned to any one of them. A doctoral candidate who is interested in such a program should consult with those members of the staff who are most competent to advise him with respect to his special interests. After he has formulated a program of courses and readings which are pertinent to his major interest he should present his proposal to the Dean of the Graduate School. If the student's plan of specialization seems warranted and if he seems competent to utilize materials from two or more recognized fields of learning, the Dean of the Graduate School will appoint a committee from the staffs of the departments which will be most intimately concerned with his work and a representative of the Graduate School. This committee will analyze the student's program, study its feasibility and determine that all basic requirements essential for sound scholarship and the preparation of a satisfactory dissertation have been met. This committee will direct the student's program and supervise the preparation of his dissertation. The dissertation must have the unanimous approval of this committee. The department from which the degree is granted will be determined by the advisory committee subject to the approval of the department concerned.

THE FRANZ THEODORE STONE INSTITUTE OF HYDROBIOLOGY

The Franz Theodore Stone Institute of Hydrobiology on Gibraltar Island, Put-in-Bay, Ohio, affords exceptional opportunities to graduate students who wish to carry on research work in hydrobiology. The Institute will be open during the entire year and students may register for work during any or all of the Quarters. The general rules that apply to graduate work carried on at the University apply equally to the graduate work taken at the Institute. The work of instruction is carried on by members of the University Faculty and by members of the faculties of other colleges and universities approved by the Graduate Council. Students interested in this work should send to the University Examiner for the Franz Theodore Stone Institute of Hydrobiology Bulletin.

REQUIREMENTS FOR THE DEGREES OF MASTER OF ARTS AND MASTER OF SCIENCE

Residence Requirement. A minimum residence of three Quarters wholly devoted to graduate work or its equivalent in part-time work is required (forty-five Quarter hours). A graduate of The Ohio State University may do not to exceed one-half of the required work at another institution having equivalent opportunities for study. The candidate is, however, subject to final examination by The Ohio State University on all work offered for the degree. Ordinarily students do not complete the work for the degree in the minimum time.

Students entering from other accepted graduate schools will be credited with work already completed, provided authorized statements are presented to the effect that such students have credit in the graduate school for the work specified. *However, no student will be given a degree by The Ohio State University unless he has satisfactorily completed forty-five Quarter hours of work under the guidance of this University.*

A candidate for the Master's degree must be registered in the Graduate School during the Quarter in which he expects to receive the degree.

Course of Study. The course of study shall be selected in consultation with the student's adviser (see page 32). It must show a reasonable degree of concentration on interrelated subjects and must be pursued under at least two professors. The course of study outlined shall be subject to the general approval of the Dean of the Graduate School.

While qualification for the Master's degree is not based entirely upon the completion of a definite number of hours of work, nevertheless, the amount of work required must aggregate not less than fifteen Quarter hours of classroom work in each of three Quarters, inclusive of the thesis, or the equivalent in part-time work. This presupposes that the student has completed the necessary prerequisites for graduate work in his chosen field and has been admitted to the Graduate School without condition.

Standard of Work Required. A graduate student doing acceptable work for the Master's degree must maintain a "B" (3.0) average in all work included in the course of study outlined for his degree, with no more than one-third of the credit hours with grades of "C" or lower. Grades lower than "C" do not carry graduate credit, although they are counted in determining the point-hour ratio.

As soon as a student's record falls below the above requirements, he will be made "Special" and will not be reinstated as a candidate for the Master's degree except by permission of the Executive Committee of the Graduate Council. A student who has been made "Special" because of low grades will not be permitted to register for thesis or dissertation work nor will he be permitted to take the foreign language examinations for the Master's degree or the Doctor of Philosophy degree. He may register for minor problems only if the instructor in charge of the work certifies in writing that the work is not to be applied to a thesis or dissertation. Grades made in minor or special problems courses or workshops may not be counted in determining the point-hour ratio of students on "Special" status who petition for reinstatement to regular status, except in those cases in which the committee on graduate work of the department involved or the chairman of the department where no such committee exists, makes a specific recommendation to the Executive Committee.

Admission to Candidacy. A student desiring to be admitted to candidacy for a Master's degree must file his application for admission to candidacy for the degree at the Office of the Graduate School at a date not later than two weeks after the opening of the Quarter in which the degree is sought.

If permission is granted for the late filing of this petition, a penalty of \$5.00 will be assessed the candidate.

Application is made upon a special blank secured from the Office of the Graduate School. The applications are passed upon by the Executive Committee of the Graduate School. Admission to candidacy is based upon undergraduate training and ability to pursue graduate work as revealed by the official reports upon the student's course. No student will be admitted to candidacy until he has completed at least the equivalent of two Quarters' work.

Examination. A student working for a Master's degree is required to pass the regular final examinations in all courses for which he is registered and must receive grades in accordance with the regulations of the Graduate School. A final comprehensive examination also is required to test the candidate's knowledge of the course of study which he has pursued. This examination is held after the submission and approval of the thesis; it is conducted by a committee composed of the candidate's adviser (chairman) and at least one other member of the instructional force chosen by him. The final examination may be either written, oral, or both at the option of the examining committee. The chairman of the committee is responsible for arranging the examination and for certifying its results to the Dean of the Graduate School. The report of this committee must be unanimous in order to be considered satisfac-

tory. However, when the examining committee consists of three or more members of the instructional staff, in case of a *single* dissenting vote, the case is automatically referred to the Executive Committee with power to act.

A candidate who fails in his final examination must register in the Graduate School and carry on work for an additional Quarter before an opportunity will be given for a second examination, unless special permission is granted by the Executive Committee for an earlier examination at the request of the department concerned. No student will be permitted a third examination.

Thesis. A satisfactory thesis is required. The subject of the thesis, together with the written approval of the professor directing the work, must be filed in the Office of the Graduate School at the time the student applies for admission to candidacy.

A booklet containing detailed information concerning the form and regulations governing the mechanics of preparing the thesis and abstract may be obtained by writing to the Office of the Graduate School.

A joint thesis may be presented for the Master's degree by not more than two students under the following conditions: Requests for presentation of joint theses must be made to the Executive Committee in advance of undertaking the work. Such requests must have the written approval of the adviser and the chairman of the department in which the work is to be undertaken. If approved, the Executive Committee may impose any conditions it sees fit. Separate examinations must be held for students presenting joint theses. Two copies of joint theses shall be required but both students must pay the abstract and binding fees.

A candidate who expects to receive his degree at the end of a given Quarter must submit the completed manuscript of his thesis ready to be typed to his adviser not later than four weeks prior to Commencement Day. If the manuscript is approved the candidate must at once prepare two typewritten copies of the same, following specifications which may be obtained at the Office of the Graduate School. If the thesis is then approved the candidate shall deposit it in duplicate in the Office of the Graduate school *not later than a date which will be set by the Graduate School for each Quarter* and must pay, at the same time, to the Bursar a fee (\$4.25) covering the cost of binding the same.

In case the thesis has already been published, the candidate, instead of following the above procedure, may present two printed unbound copies to his adviser, not later than four weeks prior to Commencement Day. The form of printing as well as the contents must be approved by his adviser. If the thesis is so approved the student must deposit these copies in the Office of the Graduate School *not later than a date which will be set by the Graduate School for each Quarter* and must pay to the Bursar a fee (\$4.25) covering the cost of binding the same.

The thesis requirement may be waived by the Dean of the Graduate School upon the written recommendation of the candidate's adviser. In all cases where the requirement is waived, action must be taken prior to the date for the filing of the thesis subject.

Abstract of Thesis. Each candidate must deposit in the office of the Graduate School one *approved* typewritten copy of an abstract of the thesis of approximately three hundred words in length. At the close of each Quarter the Graduate School proceeds immediately to print the abstracts of all the theses submitted during the Quarter, and to bind these together, in sufficient numbers to meet the exchange list of the University Library. Each candidate must deposit with the Bursar of the University not later than a *date which will be set by the Graduate School for each Quarter* the sum of \$10.00 in cash. This sum will be used by the Graduate School to defray expenses connected with the editing, printing, and binding of the abstracts of theses.

Time Limit on Work for Master's Degree. The entire work for the Master's degree must be completed within a period of six years. In the case of students who take *all* the work for the Master's degree during Summer Quarters, the above rule will be interpreted to include the seventh Summer Quarter.

REQUIREMENTS FOR THE DEGREE MASTER OF EDUCATION

Requirements for Admission. The Master of Education degree is given in the Departments of Education and Agricultural Education. A student wishing to work toward the degree Master of Education must meet the usual requirements for admission to the Graduate School as indicated on page 32 of this bulletin. In addition a minimum of one year of experience in teaching or in some other type of educational service is required for students working toward this degree in education. For students in agricultural education a minimum of one year of experience in teaching vocational agriculture or some other agricultural education experience is required. Students without the above teaching experience may be admitted to the program but must secure the required experience before completion of the requirements for this degree.

Advisory System. After admission to the Graduate School, a student who wishes to work toward the Master of Education degree in education must confer with a representative of the Committee on Graduate Work in Education. At this conference his specific area of specialization will be decided upon and an adviser will be appointed. Students who wish to work toward this degree in agricultural education should report to the Chairman of the Department of Agricultural Education.

Residence and Course Requirements. A minimum of fifty-two Quarter hours of graduate work is required. The specific requirements of the Department of Education provide that, of the minimum of fifty-two hours of graduate work required, at least fifteen hours must be in the Department of Education; at least twenty-five hours, including the fifteen mentioned above, must be in departments of the College of Education; not more than thirty hours may be in the student's specific area of specialization; and not more than fifteen hours may be in minor problems, field service project or research study in education, or in *ad interim* work. The specific requirements of the Department of Agricultural Education provide that, of the minimum of fifty-two hours of graduate work required, at least twenty hours and not more than thirty-five hours shall be in the Department of Agricultural Education; at least twelve hours shall be in the Departments of Education and/or Psychology, and at least six of these twelve hours must be in the Department of Education; and not more than twenty hours may be in special problems, practicums, field service project or research study in agricultural education, or in *ad interim* work. (See page 37 for a detailed description of *ad interim* work.)

Standard of Work. Students working toward the Master of Education degree must maintain the same standards concerning grades and point hour ratio as are required of students who are working for the Master of Arts degree. These standards are stated on page 38.

Field Service Project or Research Study. This project is designed to enable the student to demonstrate ability to attack and deal with a problem independently. The field service project must be of such a character as to warrant the candidate's receiving a minimum of three Quarter hours of credit upon its successful completion. He will register for Education 835 or Agricultural Education 835 to receive credit for the project. The candidate will submit a written report upon completion of the study. An abstract, not to exceed 250 words, shall likewise be required. The written report and abstract shall be deposited in the office of the department in which he is specializing.

Final Examination. A final examination is required of all candidates for the degree Master of Education. This examination must consist of a two-hour written examination followed by an oral examination. The candidate's adviser is responsible for arranging the final examination and for certifying the results to the Graduate School Office. The examining committee will consist of the adviser, who acts as chairman, and at least one other member of the staff chosen by him. In order to be considered satisfactory, the report of the examining committee must be unanimous. If a student fails the final examination, a second examination may be taken under the same conditions as obtain for the degree Master of Arts. No student will be permitted a third final examination.

Detailed information concerning the requirements for this degree may be obtained from the Chairman of the Committee on Graduate Work in Education, Room 120, Arps Hall, or the Chairman of the Department of Agricultural Education, Room 100, Rehearsal Hall.

REQUIREMENTS FOR THE DEGREE OF MASTER OF DENTAL SCIENCE

Requirements for Admission. Requirements for admission to courses leading to the degree of Master of Dental Science (M.D.Sc.) are a better than average record in pre dental education and graduation with high standing from a dental curriculum, the entrance and graduation requirements of which are equivalent to those now obtaining for the College of Dentistry, The Ohio State University. One year of hospital internship or equivalent is recommended but not required. Candidates for the degree should be well grounded in one or more of the fundamental sciences such as anatomy, histology, physiology, bacteriology, pathology, physics or chemistry.

The program has been developed to give postdoctorate training in one of the specialties of Dentistry. The specialties offered are Orthodontics, Oral Surgery and Anesthesia, Prosthesis, Periodontics, Oral Pathology, and Diagnosis.

Residence Requirement. A minimum of at least six Quarters of full-time work will be necessary to fulfill the residence requirement.

Language Requirement. Although a reading knowledge of German and French is desirable, it will not be a requirement for this degree unless the field of the candidate's investigation necessitates reference to publications in those languages.

Course of Study. Within the first three months of residence the candidate shall submit to the Dental Graduate Committee his proposed program designating the fields of his major and minor. The major shall be one of the specialties enumerated above and two-thirds of the period of residence shall be devoted to its study. The minor shall be in related basic sciences and one-third of the period of residence shall be devoted to its study. Courses in the related basic sciences are listed in the announcement of the Graduate School.

Thesis. Original work must form the basis of a thesis which every candidate shall submit. The subject of the thesis may be in the major or related minor fields and shall be submitted before the end of the third Quarter of residence. The subject of the thesis shall be approved by the candidate's adviser in his major and minor field, as well as by the Dental Graduate Committee. The thesis must show ability to work independently and give evidence of independent thought both in perceiving problems and in making satisfactory progress toward their solution. Familiarity with the bibliography of the special field and correct citation of authority is expected. Unanimous approval of the thesis by the thesis committee will be necessary for acceptance.

Requirements concerning the form in which the thesis shall be submitted as well as the time at which the thesis shall be submitted, the financial obligations and abstract of the thesis are found on page 40.

General Examination. A conference will be held with the candidate at the end of the first six months of residence. A conference committee will be appointed by the Dean of the Graduate School on recommendation of the Dental Graduate Committee. The conference will be held for the purpose of determining the potentialities of the candidate for successfully completing the work which he has indicated he wishes to undertake.

The Final Examinations. *Before final oral and written examinations may be taken, certification of the candidate's ability to practice his major as a specialty must be given by those familiar with the candidate's work.*

The candidate shall be eligible for the final written examination in the field of the major after acceptance of the thesis. This examination shall cover all work done in the major and may include any work in the related fundamental sciences.

The candidate shall be eligible for the final oral examination after all other requirements are satisfied, including the final written examination, the acceptance of the thesis and approval by those familiar with the work of the candidate and their certification that he is capable of practicing his major as a specialty of Dentistry. The final oral examination will include questions on the history of Dentistry with special reference to the candidate's major field, defense of his thesis, and questions on the related basic sciences.

The final written examination shall be held at least four weeks, and the final oral examination at least two weeks, prior to the Commencement at which the candidate expects to receive the degree. The examining committee shall be appointed by the Dean of the Graduate School on recommendation of the Dental Graduate Committee. The candidate's major adviser shall act as chairman. The time and place of the examination shall be set by the chairman of the examining committee after consultation with other members of the committee.

Financial Obligations. The candidate's attention is called to the schedule of fees of the Graduate School enumerated on pages 20 and 21. In addition to these fees, a non-returnable fee of \$100 a Quarter is charged for all graduate work in Dentistry.

A few graduate assistantships in Dentistry are available. Application blanks may be obtained from the Dean of the College of Dentistry. Applications should be submitted not later than March 1 of the same year for which the assistantship is desired. A minimum of at least three years will be necessary to fulfill all requirements for the degree of Master of Dental Science if the candidate is a graduate assistant.

Candidates for this degree must also meet the general requirements regarding standard of work, admission to candidacy, abstract of thesis, etc., as are prescribed for the degrees Master of Arts and Master of Science by the Graduate School.

REQUIREMENTS FOR THE DEGREE OF MASTER OF MEDICAL SCIENCE

The degree of Master of Medical Science (M.M.Sc.) is granted on the basis of the successful completion of graduate work, in recognition of the candidate's high attainment and ability in his special field as shown by the preparation of a thesis which is a definite contribution to knowledge, and by an examination covering the candidate's special field of interest. The degree may be taken in Medicine, Obstetrics and Gynecology, Pediatrics, Radiology, or Surgery.

Admission. For admission to this course, the following requirements must be met: (a) an M.D. degree from an approved college of medicine; (b) at least one year of internship in an acceptable hospital; (c) a capacity for independent work and research in some special field; and (d) written approval of the Chairman of the Department.

Language Requirement. While no formal language requirement is imposed, ordinarily a candidate should have a reading knowledge of French and German sufficient to enable him to read the literature of the field in which he is working. The professor in charge of the thesis (the student's adviser) will not approve a student for admission to the program until he is satisfied that the student's knowledge of foreign languages is sufficient for effective work in the field of research.

Course of Study. The course of study varies with the departmental program of graduate work and according to the interests and plans of the individual student. Most departments offering work leading to the Master of Medical Science degree have regular seminars and conferences on literature for which students may register. The student has the opportunity to register for advanced courses in the basic sciences that contribute to his graduate education and research. Independent research resulting in a thesis is the significant part of the qualifications for this degree.

Residence Requirement. A minimum of 45 Quarter hours of graduate study is necessary to meet the residence requirements for this degree. The student must be registered in the Graduate School during the period of residence.

Thesis. The thesis must give evidence of originality and power to carry on independent investigation. It must embody results of research which form a real contribution to knowledge and must show a mastery of the literature of the special field. The results of the investigation should be of such significance that they would always be suitable for publication in one of the learned journals in that field. Not later than a date which will be set by the Office of the Graduate School, during the student's last Quarter of registration, two approved typewritten copies of the thesis must be deposited in the Graduate School Office. The thesis must be typed in accordance with specifications furnished by the Graduate School Office. The student must deposit with the Bursar of the University the sum of \$4.25 to cover the cost of binding the two copies of the thesis.

Final Examination. After the thesis has been completed and accepted, the Dean of the Graduate School shall appoint an examining committee consisting of the candidate's adviser as chairman and at least two other members of the graduate faculty representing the same or allied fields of science. The examination may be either written or oral at the option of the committee. It shall have special reference to the thesis and the candidate's field of specialization. A unanimous affirmative vote of all members of the committee shall be necessary for the recommendation of the candidate for the degree. The chairman of the examining committee shall be responsible for arranging the final examination and for certifying the results of the examination to the Office of the Graduate School. This examination must be taken in the student's last Quarter of residence, not later than a date which will be set by the Office of the Graduate School for each Quarter.

Candidates for this degree must also meet the general requirements regarding standard of work, admission to candidacy, abstract of thesis, abstract fee, etc., prescribed for the degrees, Master of Arts and Master of Science.

GRADUATE CURRICULA IN SOCIAL ADMINISTRATION

The special requirements for the degree Master of Social Work are given on page 325 of this bulletin.

GRADUATE COURSE IN PUBLIC ADMINISTRATION

Special requirements for the degree Master of Science in Public Administration are given on page 314 of this bulletin.

DEGREE OF MASTER OF BUSINESS ADMINISTRATION

To receive the degree of Master of Business Administration, students must comply with all the regular requirements laid down for the degree of Master of Arts and Master of Science (see page 38). In addition to these requirements each candidate must meet the following general requirements.

Prerequisites. Before a student may become a candidate for the degree of Master of Business Administration or early in his Master's work he must have credit for the following subjects: Principles of Economics, Principles of Accounting, the equivalent of three Quarter hours in Business Law, Introductory courses in Corporation Finance, Industrial Management, Marketing, Economic Statistics, and Money and Banking. (If the specific courses noted are taken while the student is enrolled in the Graduate School, credit so earned will not be counted toward the requirements for the Master of Business Administration degree.)

In addition to these general prerequisites, the department in which the candidate elects to specialize will have the following prerequisites:

The Department of Accounting: credit for additional courses in Business Law, nine Quarter hours; Public Finance, five Quarter Hours; Accounting, thirty Quarter hours.

The Department of Geography: at least fifteen Quarter hours in courses in Geography on the 600 level or above.

Requirements for the Degree. A thesis will be required of all candidates for the Master of Business Administration degree and the credit granted for the thesis shall not exceed six Quarter hours.

The graduate credit granted for work in the field of specialization shall not be less than fifteen nor more than twenty Quarter hours, exclusive of the thesis.

The candidate shall take a minimum of six Quarter hours of work in each of two fields other than his field of specialization.

In addition to the foregoing, the department in which the candidate elects to specialize will have the following requirements:

The Department of Accounting: Not less than fifteen Quarter hours shall be in courses open only to graduate students and at least one of such courses must be taken outside the field of specialization.

The Department of Business Organization: Not less than fifteen Quarter hours shall be in courses open only to graduate students and at least one of such courses must be taken outside the field of specialization. Candidates for the Master of Arts degree whose field of specialization falls in this department shall be held to the same basic requirements for admission to candidacy as in the case of candidates for the Master of Business Administration degree.

Examination. For the M.B.A. degree the examination requirements for the Master of Arts and Master of Science are modified as follows: (1) a candidate shall be required to take a written examination in his major field, while a written examination in a minor field may also be given at the discretion of his adviser; (2) the oral examination shall cover the thesis and its implications and is to be given by a committee chosen by the adviser, at least one member of which must be outside the major field of the candidate's specialization.

REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

Scholastic Requirements. The general requirements for the degree of Doctor of Philosophy are: (1) A reasonable mastery of the field of specialization chosen, tested by a general comprehensive examination given approximately one year previous to the date on which the candidate expects to come up for the degree; (2) compliance with the language requirements as set forth

in the paragraph entitled "Language Requirement," see below; (3) the presentation of an acceptable dissertation embodying the results of an original investigation; and (4) the passing of a final oral examination upon the dissertation and the immediate field in which the investigation lies.

Residence Requirement. At least three years of work devoted wholly to graduate study and investigation with suitable facilities and under proper supervision—or the equivalent thereof in part-time work—are required for the completion of the residence requirement for the degree Doctor of Philosophy. Of these years, at least one must be spent in residence at this University. In case any part of the work is done elsewhere than in this University, such work shall be subject to the approval of the Graduate Council. Ordinarily, students do not complete the work for the degree in the minimum time.

The residence requirement for the Ph.D. degree may not be satisfied by residence during Summers only. Three consecutive Quarters of full time work (forty-five Quarter hours) *in residence* are required after the Master's degree or after one year of graduate work when the Master's degree is not taken. Requests for variations of this rule, resulting from employment on the campus, should be presented in advance to the Executive Committee for consideration after approval by the student's adviser.

A candidate for the degree Doctor of Philosophy must be registered in the Graduate School during the Quarter in which he expects to receive the degree.

Course of Study. The course of study to be pursued for the Doctor's degree will be arranged with each student by his adviser, but the choice of work must be approved as a whole by the Dean of the Graduate School. Work in other departments will be advised according to the needs of the individual student. In all cases the aim will be a reasonable concentration and a reasonable breadth of study, designed to foster both a knowledge of the specialty in relation to allied branches of learning and the power of productive scholarship.

Standard of Work Required. A graduate student doing acceptable work towards the degree Doctor of Philosophy is expected to do work at least of "B" quality in all courses whether for graduate credit or non-credit.

The record of each student is considered on its merits and the cumulative point-hour ratio of the record of the Ph.D. candidate is not computed. If, on review by the Executive Committee of the Graduate School, a student is judged to have an unsatisfactory record, his major department is asked by the Executive Committee to make a recommendation about his continuing to work toward the Ph.D. degree. A record is considered to be unsatisfactory when the student has received three "C"s, two "D"s, or "E"s, or a combination of such grades.

Language Requirement. The foreign language requirements for the Ph.D. degree may be met by one of the two following methods: (1) A dictionary reading knowledge of two modern foreign languages; (2) a thorough reading knowledge of one modern foreign language. A classical language may be submitted in lieu of a modern foreign language when the classical language contributes to the student's field of specialization and if approval is given by the student's adviser, the Chairman of the major department, and the Chairman of the Department of Classical Languages.

A foreign, non-English speaking student may not use his native language in meeting the language requirement. However, if the departmental committee on graduate work or the chairman of the department where there is no such committee certifies that the language in question is normally accepted by that department for the language requirement and that there is a significant body of literature pertaining to the student's major field, the Executive Committee may make an exception to the general practice.

The candidate's adviser, after securing the approval of the chairman of the department must notify the Office of the Graduate School, in writing at

least three Quarters before the student's admission to candidacy, of the method which the candidate will use in fulfilling the language requirements.

The modern foreign languages submitted under methods 1 and 2 must be languages in which there is a substantial body of scholarly literature bearing upon the student's field of specialization.

Credit for language examinations passed in other institutions may not be transferred to The Ohio State University to meet the foreign language requirement for the Ph.D. degree.

The foreign language requirement must be met not later than the Quarter preceding the Quarter in which the student is admitted to the General Examinations. Examinations for a dictionary reading knowledge of French, German, or Spanish will be given by the foreign language departments once a Quarter, on dates set by the Office of the Graduate School, usually during the fourth week of the Quarter. Students must file their intention to take these examinations with the Office of the Graduate School at least two weeks before the dates set for the examinations. Dictionary reading knowledge examinations in languages other than the ones listed above and thorough reading knowledge examinations are given by appointment. Students desiring to take such examinations must call at the Office of the Graduate School for examination blanks before making an appointment with the Examiner.

In view of these regulations the student may avoid possible postponement of his General Examinations by taking steps toward meeting the foreign language requirement for the Ph.D. degree as soon as he decides to start working toward the degree. Immediately after selection of the language or languages the student is advised to consult the appropriate persons in the language departments for guidance as to the proper methods of language preparation.

A candidate may repeat the examination in a language which he has failed. However, he shall not be permitted to take more than *three* examinations in any language.

No student will be permitted a re-examination in modern foreign languages during the same Quarter in which he failed the examination. Permission for re-examination in subsequent Quarters can be granted only by the examiner, upon evidence of work done since the former examination, sufficient to justify a re-examination.

General Examinations and Admission to Candidacy. Not later than the middle of the second Quarter prior to the Quarter in which he expects to come up for his degree, a student working for the degree Doctor of Philosophy is required to pass general comprehensive examinations on the fundamentals of the entire field in which he has elected to specialize without limitations to the courses which the student has pursued. For example, a student who expects to come up for the degree at the end of the Spring Quarter must pass the General Examinations *not later* than the middle of the Autumn Quarter. He must be registered during the Quarter in which he expects to take the General Examinations unless excused by the Dean of the Graduate School. The Examinations must be written followed by an oral examination. The satisfactory passing of these examinations carry with them admission to candidacy for the degree.

If the dissertation is not completed within seven years after the General Examinations are passed, the candidate shall be required to take a supplementary General Examination and may be required by his department to be in residence one or more Quarters before taking this examination. This rule becomes effective for all students who passed the General Examinations during the Spring Quarter, 1951-1952 and thereafter.

After admission to candidacy, the candidate must be registered in the Graduate School for at least two and one-half additional Quarters provided this will complete his residence requirement. Whenever a student is permitted

to take the General Examinations without being registered, he must register for at least *three* more Quarters before coming up for the degree. He will be given complete freedom from all course requirements and will normally be registered for dissertation only. However, he may register for credit for courses in his major and cognate fields upon recommendation of the adviser and with permission of the Dean of the Graduate School. He will also be permitted to audit courses provided he obtains the usual written permission of the instructors in charge. No student will be permitted to take the General Examinations until he has met the language requirement.

The General Examinations are conducted by a committee appointed by the Dean of the Graduate School, upon written request of the student's adviser. This committee shall consist of the student's adviser (who acts as chairman), and such other examiners as the Dean may designate, including at least one who is not a member of the department directly concerned. The outside member of the committee should be a staff member who is approved to advise candidates for the Ph.D. degree in his own department. When the adviser decides that the student is ready for the General Examinations, he will so notify the Office of the Graduate School, in writing, at the same time suggesting the personnel of the examining committee, for the approval of the Dean. After the committee has been approved by the Dean, appropriate blanks for reporting the results of the examination will be sent to the adviser. The selection of a time and place for the examination will be entirely in the hands of the adviser, but he is expected to consult with the various members of the committee before fixing a time for the examination. Immediately after the close of the examination the committee shall certify to the Graduate School, on the blank furnished the committee, whether or not the student has passed the examination. In order to be considered satisfactory, the report of the examining committee must be unanimous. However, when there is but a *single* dissenting vote the case is automatically referred to the Executive Committee with power to act.

If a candidate fails the General Examinations he cannot be re-examined until the examining committee recommends such a re-examination and the Executive Committee approves the recommendation. No candidate will be permitted to take the General Examinations more than twice.

Dissertation. A dissertation which is a definite contribution to knowledge of importance sufficient to warrant its publication shall be offered by the candidate. *A copy of the completed dissertation bearing the written approval of the candidate's adviser must be presented at the Office of the Graduate School not less than six weeks previous to the end of the Quarter in which the degree is sought.*

The Dean, after consultation with the candidate's adviser, shall then appoint a Committee to consider the merit of the dissertation. In order to expedite the reading of the dissertation by the committee, it is suggested that the first draft of the dissertation be accompanied by a written suggestion from the candidate's adviser concerning the personnel of the reading committee. In order to be considered satisfactory the report of the committee must be unanimous.

A booklet containing detailed information concerning the form and regulations governing the mechanics of preparing the dissertation and abstract may be obtained by writing to the Office of the Graduate School.

Each candidate must deposit in the Office of the Graduate School, not later than a date which will be set by the Graduate School for each Quarter, two *approved* printed or typewritten copies of the complete dissertation, complying in form with specifications obtainable in the Graduate School office. The candidate must also deposit the sum of \$4.25 with the Bursar of the University to cover the cost of binding these copies.

Abstract of Dissertation. Each candidate must also deposit in the Office of the Graduate School, not later than a date which will be set by the Graduate

School for each Quarter, one *approved* typewritten copy of an abstract of the dissertation. The abstract must be limited to 600 words. He must also deposit with the Bursar of the University, not later than a date which will be set by the Graduate School each Quarter, the sum of \$40.00. This sum will be used by the Graduate School to defray expenses connected with the editing, and microfilming of the dissertations and abstracts.

The Final Examination. The final examination is held after the approval of the dissertation by the reading committee. It shall be conducted by a committee consisting of the candidate's adviser (who shall act as chairman) and such other examiners as the Dean of the Graduate School shall designate, after consultation with the candidate's adviser, and shall include at least one person who is not a member of the department directly concerned. The outside member of the committee should be a staff member who is approved to advise candidates for the Ph.D. degree in his own department. The time and place of the examination shall be set by the Chairman of the Examining Committee after consultation with the other members of the committee and the Office of the Graduate School shall be promptly notified. The examination shall be oral and shall deal intensively with the portion of the candidate's field of specialization in which his dissertation falls, though it need not be confined exclusively to the subject matter of the dissertation. A written examination also may be required at the discretion of the department concerned. In order to be considered satisfactory the report of the examining committee must be unanimous. However, when there is but a *single* dissenting vote, the case is automatically referred to the Executive Committee of the Graduate School with power to act.

COMMENCEMENT—CONVOCATION

A special Convocation or Commencement is held at the close of each Quarter for the conferring of degrees upon candidates who have fulfilled all the requirements of their respective courses.

ATTENDANCE AT CONVOCATION EXERCISES

All candidates for degrees are required to be present at their graduation convocation unless excused by the President.

RESEARCH INSTITUTES

Institutes of the Graduate School are associations of faculty members who are interested in respective broad fields of study, without regard to their location in the University. Although the Institutes are organized somewhat differently, in general they are composed of interested faculty members and committees on research, program and instruction, under the leadership of a selected professor. The chairmen of the Institutes report annually to the Graduate Council and through the Graduate School Record to the faculty.

(a) The Institute of Nutrition and Food Technology promotes research and instruction in these fields in numerous departments of the University and the Ohio Agricultural Experiment Station. It sponsors lectures and conferences on appropriate subjects.

(b) The Institute for Research in Vision associates the members of the faculty active in educational, physical, physiological, psychological and medical aspects of vision.

(c) The Institute of Genetics is an outgrowth of an interdepartmental seminar in genetics that has been conducted for over twenty years. The Institute continues this seminar, encourages research in genetics at the University and the Ohio Agricultural Experiment Station, and arranges a program of lectures in the field of genetics.

(d) The Institute of Geodesy, Photogrammetry and Cartography was recently organized to encourage research and to provide an integrated program of instruction and training in the closely related fields of geodesy, photogrammetry and cartography. The Institute is composed of interested faculty members in various departments where instruction and research on these subjects are conducted. The Council approved the establishment of an Interdepartmental Committee on Research in Communication which is active in interdepartmental research and guidance of Ph.D. candidates in this field.

(e) The Institute of Child Development and Family Life was organized in the spring of 1954 to promote research and instruction in the study of children and family life. Members of the Institute are drawn from more than twelve departments.

(f) The Social Science Research Council is comparable to the Institutes described above. It encourages and coordinates a research program in the social sciences, effects cooperation between the cognate areas, and enlists support for the work. The membership of the Council consists of representatives of the faculty and administration concerned with social science research, the Dean of the Graduate School serving as Chairman.

UNIVERSITY ORGANIZATIONS

There are a number of organizations in the University of especial interest to the graduate students. The Gamma Alpha Fraternity, a graduate scientific society, has its own house at which a number of the members of the society live and a still larger number board. Phi Delta Gamma, national fraternity for graduate women, is the only Greek letter organization whose membership is open to women of all professional interests who are studying in the graduate or advanced professional schools of universities. There are eleven active chapters and three alumnae chapters in leading universities. The purpose of Phi Delta Gamma is twofold: to promote the highest professional ideals among women of graduate schools, and to advance the social welfare and activities of women in graduate schools.

The main object of all of these clubs is to bring members together for social purposes and for the discussion of the various problems in which the individual members are interested.

There are also chapters of the national honorary societies, Phi Beta Kappa and Sigma Xi, as well as a number of honorary fraternities. In addition to these, nearly every department offering graduate work has its own graduate club.

UNIVERSITY LECTURES

Each year a number of lectures of special interest to graduate students are given by distinguished scholars from various educational institutions. Some of these lectures are of interest primarily to those in certain fields of work while others are of a general character and of interest to graduate students in general, no matter what their fields of activity may be.

DEPARTMENTS OF INSTRUCTION

The general prerequisites for courses open to graduate students with credit toward a degree are given below. In some departments more detailed prerequisites are required, and in all such cases a statement of these will be found in the description of the courses listed in the bulletins of the respective undergraduate colleges.

General prerequisites for courses numbered from 600 to 799:

At least junior standing and prerequisites that amount to 20 Quarter hours in the same and allied subjects of which a minimum of at least 10 Quarter hours must be in the same subject; or 30 Quarter hours in not more than two allied subjects.

Special prerequisites as stated in the description of courses must be included within these requirements.

Certain 600 courses in the field of education require as a prerequisite graduate standing in the field of education. These courses are appropriately designated in the list given under the general heading of "EDUCATION."

General prerequisites for courses numbered 800 or above:

These courses are open only to students registered in the Graduate School and have prerequisites that amount to 30 Quarter hours in the same and allied subjects, of which a minimum of 15 Quarter hours must be in the same subject.

COURSES OF GENERAL INTEREST

The courses listed below are of such a character as to be of general interest to all graduate students irrespective of their fields of specialization.

Survey Course 605. Foundations of Contemporary Civilization.

Survey Course 608. Development of Modern Science.

(For a full description of these courses, see page 346 of this bulletin, under the heading "Survey Courses.")

Philosophy 652. Philosophy of Science.

(For a detailed description of this course, see page 270 of this bulletin.)

ACCOUNTING

Office, 452 Hagerty Hall

PROFESSORS MILLER, TAYLOR, ECKELBERRY, WILLCOX, DICKERSON, HECKERT, GREER, AND MCCOY, ASSOCIATE PROFESSORS SHONTING, BURNHAM, JENCKS, AND DOMIGAN, ASSISTANT PROFESSORS COX, FERTIG, AND NOBLE

Graduate Work in Accounting

Students may take either the Master of Business Administration or the Master of Arts degree. Those interested in the Master of Business Administration degree should see the requirements set forth on page 45.

Any students with an undergraduate major in accounting may begin graduate study of accounting for the Master of Arts degree if he has had the equivalent of Elements of Accounting, Intermediate Accounting, Advanced Principles of Accounting, Cost Accounting, Financial Statement Analysis Economic Statistics, Corporation Finance, and nine Quarter hours of Business Law. (If the courses noted are taken while the student is enrolled in the Graduate School, credit so earned will not be counted toward the requirements for the Master of Arts degree.)

Graduate students in accounting shall select for specialization a specific area within the accounting field after consultation with the chairman of the department. A general course of study will then be arranged.

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," see page 61.

602. Advanced Principles of Accounting. Five credit hours. One Quarter. Autumn, Winter, Spring. Five class meetings each week. Mr. Burnham, Mr. McCoy, Mr. Shonting.

A study of the application of basic principles to the accounting problems arising in connection with consignment sales, installment sales, branch house operations, mergers and reorganizations, statements for holding companies and their subsidiaries, the dissolution of business units, and fiduciary operations.

Not available for graduate credit for students majoring in accounting.

603-604. Cost Accounting. Five credit hours. Two Quarters. 603, Autumn and Winter; 604, Winter and Spring. Five class meetings each week. Not open to students who are taking Accounting 624. Mr. Cox, Mr. Fertig, Mr. Willcox.

The work of the first Quarter consists of a discussion of the fundamental principles of cost determination. Emphasis is placed on the use of cost information in the control of manufacturing activities and the relationships between costs, selling prices, and profits. Accounting for material cost, labor cost, and manufacturing expense is discussed in detail.

In the second Quarter a study is made of the cost accounting principles arising in connection with process costs, by-product costs, standard costs, and distribution costs.

Not available for graduate credit for students majoring in accounting.

616. Financial Statement Analysis. Three credit hours. One Quarter. Autumn, Winter, Spring. Three class meetings each week. Mr. Bolon.

A study of the flow or movement of funds as reflected in the financial statements. The use of ratios and other indices in the analysis and interpretation of the financial position, together with the trends and variations therein, are considered in detail. The subject matter is developed through lectures and problems supplemented with published financial statements. Each student prepares, under supervision of the instructor, an analysis of the current financial statements of some prominent corporation, together with a comparison with the principal competitors in the field.

Not available for graduate credit for students majoring in accounting.

624. Factory Costs. Five credit hours. One Quarter. Winter and Spring. Five class meetings each week. Not open to students taking Accounting 603-604. Mr. Noble.

This course is intended primarily for students whose major interest is in fields other than accounting. The methods of accumulating material, labor and expense costs for job order and process cost accounting are studied. Joint and by-product costs as well as standard costs are considered. The place and value of cost reports and the relationship of the cost department to other business departments are discussed.

626. Cost Accounting for Marketing Activities. Three credit hours. One Quarter. Winter and Spring. Three class meetings each week. General

prerequisites must include a course in intermediate accounting, a course in elementary economic statistics, and Business Organization 700. Not open to accounting majors. Mr. Dickerson, Mr. Domigan, Mr. Heckert, Mr. McCoy.

Special problems in accounting related to the distribution activities of manufacturers, wholesalers, retailers, etc. Particular attention is given to the analysis of distribution costs by territories, commodities, customer channels, and size of order; and methods of controlling cost of such functions as purchasing, warehousing, advertising, selling, delivery, credit, and collections.

641. Federal Income Tax Accounting for Individuals. Three credit hours. One Quarter. Autumn, Winter, Spring. Three class meetings each week. General prerequisites must include a course in intermediate accounting. Mr. Dickerson, Mr. Domigan.

Accounting aspects of the federal income tax with special reference to its applications in the case of individual taxpayers. Practice in the preparation of tax returns for individuals.

Not open to students who have credit for Accounting 640. Not available for graduate credit for students majoring in accounting.

642. Tax Accounting for Business Enterprises. Three credit hours. One Quarter. Autumn, Winter, Spring. Two class meetings and one two-hour laboratory period each week. General prerequisites must include Accounting 641. Mr. Dickerson, Mr. Domigan.

Accounting aspects of federal, state, and local taxes with special reference to their application in the case of business enterprises. Practice in the preparation of tax returns for business enterprises.

Not open to students who have credit for Accounting 640.

713. Accounting Practice. Four credit hours. One Quarter. Autumn, Winter, Spring. Four class meetings each week. General prerequisites must include Accounting 602, 604, and 616. Mr. Miller, Mr. Eckelberry.

Practice in the solution of typical accounting problems. The class material is taken largely from the Certified Public Accountants' examinations of the various states.

Not open to students who have credit for Accounting 613-614.

735. Auditing Principles and Procedures. Four credit hours. One Quarter. Autumn, Winter, Spring. General prerequisites must include Accounting 602, 604, and 616. Students having credit for two hours in Accounting 607 may enroll in Accounting 735 for two hours of credit. Mr. Burnham, Mr. Jencks.

The various kinds of examinations and their respective uses. The duties, responsibilities, and ethics of the auditor. Techniques and procedures used in verifying balance sheet and profit and loss accounts. The auditor's opinion and report.

Not open to students who have credit for Accounting 635.

736. Audit Working Papers and Reports. Three credit hours. Spring Quarter. General prerequisites must include Accounting 735. Mr. Jencks.

Application of the techniques introduced in Accounting 735 to a continuous practice problem. Consideration given to the types, limitations, contents, and review of working papers. Practice in the writing of audit reports.

Not open to students who have credit for Accounting 635.

737. Internal Auditing. Three credit hours. Winter Quarter. General prerequisites must include Accounting 735. Mr. Jencks.

Organization and functions of the internal auditing department. The problems arising in the execution of an internal auditing program.

799. Special Problems. Two to five credit hours. All Quarters. This course may be repeated until a maximum of fifteen hours shall have been earned.

Individual reports on selected accounting problems in the following fields of accounting:

- (a) Auditing. Mr. Miller and others.
- (b) Budgeting. Mr. McCoy and others.
- (c) Cost accounting. Mr. Willcox and others.
- (d) Systems. Mr. Willcox and others.
- (e) Taxes. Mr. Dickerson and others.
- (f) Theory. Mr. Eckelberry and others.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

804-805-806. Seminar in Accounting. Two credit hours. Autumn, Winter, and Spring Quarters.

807. Distribution Costs. Three credit hours. Autumn Quarter. Three class meetings each week. General prerequisites must include a course in intermediate accounting, Business Organization 700, and Accounting 603-604 or permission of the instructor. Mr. Willcox.

Procedure and technique for analysis and control of distribution costs. Application of sorting and tabulating equipment to sales and expense analysis will be illustrated.

808. Cost Reports for Executives. Three credit hours. Winter Quarter. General prerequisites must include forty hours of courses in accounting or the equivalent. Mr. Willcox.

An analysis of the principles underlying the preparation, use, and interpretation of cost reports for both major and minor executives.

Not open to students who have credit for Accounting 610.

810. Advanced Tax Accounting. Three credit hours. Autumn Quarter. Three class meetings each week. General prerequisites must include Accounting 641 and 642. Mr. Dickerson.

A study of some of the more complex tax problems of individual, fiduciary, and corporate taxpayers. Estate and gift taxes. Tax planning.

811. Post Filing Tax Accounting Problems. Two credit hours. Winter Quarter. Two meetings each week. General prerequisites must include Accounting 810. Mr. Dickerson.

Deficiency assessments, protests, conferences with government agents and refund claims.

813. Advanced Auditing. Two credit hours. Spring Quarter. General prerequisites must include Accounting 735. Mr. Jencks.

Investigation of auditing problems, procedures, and auditors' reports. A conference course, subject to adaptation to individual needs of graduate students.

814-815-816. Theory and Practice. Three credit hours each Quarter. Autumn, Winter, Spring. One two-hour and a one-hour period each week. General prerequisites must include Accounting 713. The senior staff.

Readings, reports, and advanced problems in the fields of financial accounting, cost accounting, theory, taxation, budgeting, municipal and institutional accounting, auditing controllership.

819. Budgeting. Three credit hours. Autumn Quarter. General prerequisites must include forty hours of courses in accounting or equivalent. Mr. McCoy.

The development of business budgets and their use in the planning and control of private business enterprises.

Not open to students who have credit for Accounting 617 or 619.

820. Controllership. Three credit hours. Winter Quarter. General prerequisites must include forty hours of courses in accounting or equivalent. Mr. McCoy.

The role of the chief accounting executive in the management and business policy-making of a private business enterprise. Accounting data for effective planning, coordination, control, and protection. Records, procedures, reports, and manuals.

Not open to students who have credit for Accounting 617 or 620.

821-822-823. System Design. Two credit hours each Quarter. Autumn, Winter, Spring. Two class meetings each week. Mr. Willcox.

Principles underlying the design and installation of accounting systems. Consideration of the systems problems in large and small business concerns as well as applications to and special problems of different industries.

Not open to students who have credit for Accounting 612 or 712.

828. Accounting Problems of Financial Institutions and Fiduciaries.

Three credit hours. Autumn Quarter. General prerequisites must include forty hours of courses in Accounting or the equivalent. Mr. Eckelberry.

Accounting principles and problems peculiar to banks, insurance companies, brokerage and investment houses, receivers, executors, and trustees.

Not open to students who have credit for Accounting 628.

830. Governmental Accounting. Three credit hours. Spring Quarter. Three class meetings each week. General prerequisites must include forty hours of courses in Accounting or the equivalent. Mr. Shonting.

The application of accounting principles to government. Problems relating to funds, appropriations and allotments. Individual assignments for study of particular phases.

Not open to students who have credit for Accounting 630.

845. Accounting Literature. One credit hour. Spring Quarter. One class meeting each week. General prerequisites must include forty hours of courses in Accounting or the equivalent. Mr. Eckelberry.

Individual reports by members of the class on recent and current published materials in the field of accounting. Review of historical development of accounting literature.

Not open to students who have credit for Accounting 645.

850. Accounting Problems of Public Service Corporations. Three credit hours. Winter Quarter. General prerequisites must include forty hours of courses in Accounting or the equivalent. Mr. Eckelberry.

Accounting problems peculiar to electric, gas, and telephone utilities, railroad and air transport companies.

Not open to students who have credit for Accounting 650.

855. Accounting Requirements of Governmental Regulatory Agencies. Three credit hours. Spring Quarter. General prerequisites must include forty hours of courses in Accounting or the equivalent. Mr. Eckelberry.

An examination of accounting requirements of the Securities and Exchange Commission, Federal Trade Commission, and the Department of Taxation and Division of Securities of the State of Ohio.

Not open to students who have credit for Accounting 655.

860. Accounting Aspects of Business Policy Determination. Three to five credit hours. Spring Quarter. General prerequisites must include forty hours of courses in accounting or the equivalent. Mr. Dickerson, Mr. Eckelberry, Mr. Miller, Mr. Willcox, Mr. Greer.

Case studies with particular attention to accounting analyses and application thereof to business problems requiring policy determination. Individual assignments, discussion, lectures, and reports.

950. Research in Accounting. Autumn, Winter, and Spring Quarters.

ADULT EDUCATION

(See Bureau of Special and Adult Education)

AERONAUTICAL ENGINEERING

Office, 108 Engineering Annex B

PROFESSOR VON ESCHEN, ASSOCIATE PROFESSORS MALLETT AND TIFFORD,
ASSISTANT PROFESSORS EDSE AND LEE

PREREQUISITES FOR GRADUATE WORK:

In addition to the requirements of the Graduate School, the student must hold a Baccalaureate Degree in Aeronautical Engineering or its equivalent. Deficiencies in his undergraduate training because of the omission of certain fundamentals or insufficient coverage must be removed by taking work in excess of the regular requirement for the degree.

The student must have maintained a point-hour average of at least 2.5 in all his undergraduate work and a point-hour average of at least 2.7 in his undergraduate Aeronautical Engineering work or comparable work if not in Aeronautical Engineering.

The applications of students desiring to become candidates for either the Master of Science or the Doctor of Philosophy Degree must be approved by the Aeronautical Engineering Department.

AREAS OF SPECIALIZATION:

A candidate for an advanced degree may choose specialization in the following fields:

AERODYNAMICS
PROPULSION
STRUCTURES

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

The following courses do not carry graduate credit for students who received the Degree of Bachelor of Aeronautical Engineering from The Ohio State University: 610, 671, 672, 673, 691, 710, and 711.

610. Aircraft Stress Analysis. Five credit hours. Autumn Quarter. Five class hours each week. General prerequisites must include Mechanics 602 and Mathematics 608.

A study of the fundamentals of the determination of aircraft loads and the resulting stresses in the components.

671. Ideal Aerodynamics. Five credit hours. Autumn Quarter. Five class hours each week. General prerequisites must include Mathematics 608, 609, and 610, or equivalent.

A study of the fundamentals of the aerodynamics of non-viscous incompressible flows.

672. Aerodynamics. Five credit hours. Winter Quarter. Five class hours each week. General prerequisites must include Aeronautical Engineering 671.

A study of the fundamentals of the aerodynamics of compressible and viscous fluids.

673. Applied Aerodynamics. Five credit hours. Spring Quarter. Five class hours each week. General prerequisites must include Aeronautical Engineering 672.

A study of the fundamentals of aircraft performance, static stability, and compressibility effects.

691. Introductory Mathematical Aeronautics. Three credit hours. Autumn Quarter. Three recitations each week. General prerequisites must include Mathematics 608, 609, 610.

Technique of analysis of engineering problems. Application of differential equations, complex variable theory and vector analysis to selected problems in Aeronautical Engineering.

704. Rotating Wing Aircraft. Three credit hours. Autumn Quarter. Three class hours each week. General prerequisites must include Aeronautical Engineering 673.

Rotating wing aircraft theory and principles, autorotation, autogyros, helicopters.

710. Aircraft Structures. Five credit hours. Winter Quarter. Five class hours each week. General prerequisites must include Aeronautical Engineering 610.

A study of stresses and deflections in aircraft structures.

724. Aircraft Stability and Control. Five credit hours. Autumn Quarter. Five class hours each week. General prerequisites must include Aeronautical Engineering 673 and 691.

A study of the fundamentals of the dynamic stability and control of aircraft.

731. Aircraft Design Laboratory. Two credit hours. Spring Quarter. Two three-hour laboratory periods each week. General prerequisites must include Aeronautical Engineering 710.

Structural design and analysis of semi-monocoque structures, aircraft truss and beam design. Familiarization with CAA, Air Force and Navy design specifications. Static demonstrations.

732. Aircraft Design Laboratory. Two credit hours. Winter Quarter. Two three-hour laboratory periods each week. General prerequisites must include Aeronautical Engineering 744 and 731.

Design of semi-tension field spars. Complete load determination, design, and analysis of an aircraft component. Static and dynamic testing.

740. Preliminary Design of Aircraft. Three credit hours. Autumn Quarter. One class hour and two three-hour laboratory periods. General prerequisites must include Aeronautical Engineering 673, 731, and 760.

Aerodynamic design and layout of aircraft to meet performance, utility, and space requirements using CAA, Air Force and Navy standards and specifications. Analytical proof of compliance.

744. Aircraft Structural Analysis. Five credit hours. Autumn Quarter. Five class hours each week. General prerequisites must include Aeronautical Engineering 710 and 731.

A study of special methods of stress analysis for skin-stressed aircraft structures. A study of the stability of aircraft structural components.

745. Aircraft Design. Five credit hours. Spring Quarter. Five class hours each week. General prerequisites must include Aeronautical Engineering 744.

Stresses due to dynamic loading. Evaluation of aircraft structural life. Fatigue. Structural effects due to heating.

754. Aircraft Flutter and Vibration. Five credit hours. Autumn Quarter. Five class hours each week. General prerequisites must include Aeronautical Engineering 672 and 691 and Mechanics 707.

Mathematical techniques of aircraft flutter and vibration analysis. The aerodynamics of flutter.

755. Aircraft Flutter and Vibration. Five credit hours. Winter Quarter. Five class hours each week. General prerequisites must include Aeronautical Engineering 754.

The structural aspects of aircraft flutter and vibration analysis.

760. Modern Aircraft Propulsion. Three credit hours. Spring Quarter. Three class hours each week. General prerequisites must include Mechanical Engineering 601 and 626 and Aeronautical Engineering 672.

Introductory course in basic principles of propulsion, engine-propeller combination, rocket, ramjet, Schmidt tube, gas turbine, turbojet.

762. Non-Rotating Propulsion Units. Five credit hours. Autumn Quarter. Five class hours each week. General prerequisites must include Aeronautical Engineering 760.

Introduction to the theoretical basis and methods for obtaining performance estimates of rockets, ramjets, and pulse jets.

765. Combustion in Jet Engines. Five credit hours. Winter Quarter. Five class hours each week. General prerequisites must include Aeronautical Engineering 672, and Mechanical Engineering 606.

The chemical addition of heat to fluids in gas turbine, ramjet, and rocket propulsion units.

770. Theoretical Aerodynamics. Three to five credit hours. Spring Quarter. Three to five class hours each week. General prerequisites must include Aeronautical Engineering 672 and 691.

Stream function, circulation and vorticity, velocity potential, conformal transformation, two- and three-dimensional airfoil theories, flow around airfoils, wind tunnel interference effects, propeller theory.

772. Theory of Compressible Flow. Five credit hours. Autumn Quarter. Five class hours each week. General prerequisites must include Aeronautical Engineering 672 and 691.

Two-dimensional compressible aerodynamics including the methods of characteristics and linearization in supersonic flows. Supersonic flow past conical bodies.

773. Advanced Aerodynamics. Five credit hours. Winter Quarter. Five class hours each week. General prerequisites must include Aeronautical Engineering 772.

Some three-dimensional supersonic flow phenomena. Subsonic, transonic, and supersonic flow about aircraft wings and bodies.

775. Aerodynamics of a Viscous Fluid. Three to five credit hours. Winter Quarter. Three to five class hours each week. General prerequisites must include Aeronautical Engineering 672.

Viscosity, stress and strain in fluids, Navier-Stokes equation and solution, boundary layers, turbulence, application to drag.

777. Superaerodynamics. Three to five credit hours. Spring Quarter. Three to five class hours each week. General prerequisites must include Aeronautical Engineering 672.

Mean free path, Maxwell's velocity distribution law, viscosity, thermal conduction, viscous slip, Maxwell's theory of slip, free-molecule viscosity, flow through tubes, temperature jump, accommodation coefficient, slip flow and free molecule flow at low Mach numbers, free molecule flow at high Mach numbers, free molecule flow over an inclined plate.

780. Exterior Ballistics I. Three credit hours. Autumn Quarter. Three hours lecture and recitation each week. Given in alternate years. General prerequisites must include Mathematics 601 and 611 or equivalent.

Introduction to the mathematical theory of trajectories. Forces acting on the projectile. Types of coordinate systems. Differential equations of the trajectory and methods of integration of the equations.

781. Exterior Ballistics II. Three credit hours. Winter Quarter. Three hours lecture and recitation each week. Given in alternate years. General prerequisites must include Aeronautical Engineering 780 or equivalent.

Detailed study of numerical integration of trajectories. Corrections for variations of parameters such as gravity, atmospheric conditions, earth's rotation, projectile spin, etc. Introduction to theory of bombing from airplanes.

782. Exterior Ballistics III. Three credit hours. Spring Quarter. Three hours lecture and recitation each week. Given in alternate years. General prerequisites must include Aeronautical Engineering 781 or equivalent.

Mathematical theory of rocket flight including aerodynamic forces on the rocket, and motion during launching, burning and after burning periods. Application of the theory to the V-2 rocket.

785. Missile Ballistics I. Three credit hours. Winter Quarter. Three hours lecture and recitation each week. General prerequisites must include Mathematics 601, 721 or Aeronautical Engineering 801 or equivalent.

Brief review of vector calculus as applied to general dynamics of a rigid body such as a missile or rocket. Mathematical methods used in numerical integration. Ballistics of the missile as a particle.

786. Missile Ballistics II. Three credit hours. Spring Quarter. Three hours lecture and recitation each week. General prerequisites must include Aeronautical Engineering 785 or equivalent.

Mathematical theory of motion of a spinning top. Applications of the theory to a missile. Dynamics of a missile moving in the earth's atmosphere. German missiles. Stability of missiles and motion outside the earth's atmosphere.

798. Advanced Studies in Aeronautical Engineering. Two to ten credit hours each Quarter, with a total of fifteen hours credit in the course. Autumn, Winter, and Spring Quarters. General prerequisites must include the consent of the department. All instructors.

The course covers special advanced topics in aeronautical engineering with the specific area under consideration announced from Quarter to Quarter.

799. Special Problems in Advanced Aeronautical Engineering. Two to ten hours each Quarter with a total of fifteen hours credit in the course. Autumn, Winter, and Spring Quarters. General prerequisites must include the consent of the department. All instructors.

This course is designed to give the advanced student opportunity to pursue special studies in Aeronautical Engineering. Work may be taken under one or more of the special topics of the field including: Aircraft structures, aerodynamics, propulsion, flutter and vibration, and stability and control.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

801-802-803. Mathematical Aeronautics. Five credit hours each. 801, Autumn Quarter; 802, Winter Quarter; 803, Spring Quarter. General prerequisites must include Mathematics 610, Physics 726, Aeronautical Engineering 691, or the equivalent.

Mathematical treatment of problems in aeronautics.

821-822-823. Dynamic Stability of Aircraft. Three to five credit hours each. 821, Autumn Quarter; 822, Winter Quarter; 823, Spring Quarter. General prerequisites must include six credit hours in aerodynamics, differential equations, and permission of the instructor.

A study of longitudinal and lateral stability and control of aircraft.

829. Advanced Study of the Dynamic Stability of Aircraft. Three to five credit hours. Autumn, Winter, and Spring Quarters.

841-842-843. Advanced Aircraft Structures. Three to five credit hours. Autumn, Winter and Spring Quarters. General prerequisites must include Aeronautical Engineering 710, and permission of the instructor.

An advanced study of aircraft structural analysis and design.

849. Advanced Study of Aircraft Structures. Three to five credit hours. Autumn, Winter, and Spring Quarters.

851-852-853. Advanced Flutter and Vibration Study. Three to five credit hours. Autumn, Winter, and Spring Quarters. Three to five class hours each week. General prerequisites must include Aeronautical Engineering 755.

Aerodynamic forces of oscillating airfoils and wings. solution of Bessel functions. aerodynamic instability involving potential flow and the Kutta condition. Mechanism of flutter effects of finite span, section shape, deviations from potential flow, bending and twisting of actual wings. Flutter velocity.

859. Advanced Study of Aircraft Flutter and Vibration. Three to five credit hours. Autumn, Winter and Spring Quarters.

861-862-863. Advanced Theory of Aircraft Propulsion. Three to five credit hours each. 861, Autumn Quarter; 862, Winter Quarter; 863, Spring Quarter. Three to five class hours each week. General prerequisites must include Aeronautical Engineering 762.

Mathematical theory of addition of heat to compressible fluids. Combustion chamber design. Theory of diffusers and nozzles. Theory of airfoil cascade. Propeller theory. Fundamentals of nuclear aircraft power plants. Exhaustive study of rocket ramjet and pulsejet systems.

869. Advanced Study of Aircraft Propulsion. Three to five credit hours. Autumn, Winter, and Spring Quarters.

871-872-873. Advanced Aerodynamics. Three to five credit hours each. 871, Autumn Quarter; 872, Winter Quarter; 873, Spring Quarter. Three to five class hours each week. General prerequisites must include Aeronautical Engineering 773, 770, and 775.

Advanced study of incompressible, compressible, and viscous flows.

874-875-876. Advanced Compressible Flow. Three credit hours each. 784, Autumn Quarter; 875, Winter Quarter; 876, Spring Quarter. Three hours lecture and recitation per week. General prerequisites must include Aeronautical Engineering 773, Mathematics 610 and 721 or equivalent.

879. Advanced Study of Theoretical Aerodynamics. Three to five credit hours. Autumn, Winter, and Spring Quarters.

950. Research in Aeronautical Engineering. Autumn, Winter, and Spring Quarters.

† Given at Wright Field.

AGRICULTURAL BIOCHEMISTRY

Office, 101 Agricultural Laboratories Building

PROFESSORS DEATHERAGE, LYMAN (EMERITUS), ALMY, BROWN, BURRELL, MOXON,
SUTTON, AND WOLFROM, ASSISTANT PROFESSORS VARNER AND MOORE

Requirements for the Master's Degree: All candidates for the Master's degree must complete a thorough training in chemistry equivalent to an undergraduate curriculum in chemistry which must include a year's work in analytical chemistry, a year's work in organic chemistry with laboratory, and at least two Quarters of physical chemistry with laboratory. Also, acceptable work in an area of biology (botany, zoology, or bacteriology) related to the student's particular interest, and Agricultural Biochemistry 601 and 609 must be presented. Additional work will be required in accordance with the student's area of interest, for example: (a) *In Plant Chemistry*—Agricultural Biochemistry 602 or equivalent, plant physiology (Botany 606 and 606) or their equivalents. (b) *In the Chemistry of Nutrition*—Agricultural Biochemistry 602, 607, 721 and 722. (c) *In Food Chemistry*—Agricultural Biochemistry 602, 607 and 713. (d) *In Dairy Chemistry*—Agricultural Biochemistry 602 and 604 (or 605), Bacteriology 607. Consult the Department for additional requirements in other areas.

Requirements for the Ph.D. Degree: In addition to the requirements for the Master's degree all Ph.D. candidates must complete an additional year of organic chemistry, including Chemistry 741 (qualitative organic analysis), a third Quarter of physical chemistry with laboratory; at least one biological science through physiology; Agricultural Biochemistry 607, 804, 805, 806, Chemistry 729 (absorption spectroscopy), or equivalents. Additional work may be required in the student's particular area of interest, for example: (a) *In Plant Chemistry*—Course work must include in addition to that specified for the Master's degree, physiological methods (Botany 725 and 730; plant microchemistry (Botany 720); Agricultural Biochemistry 801. (b) *In the Chemistry of Nutrition*—Course work must include in addition to that specified for the Master's degree, Bacteriology 607; at least ten hours of advanced physiology; Anatomy 618 and 619, and Zoology 630. (c) *In Food Chemistry*—Course work must include, in addition to that specified for the Master's degree, the following courses or their equivalents, Bacteriology 607 and 636 and Zoology 630. (d) *In Dairy Chemistry*—Course work must include, in addition to that specified for the Master's degree, the following courses or their equivalents. Agricultural Biochemistry 605 (or 604); Bacteriology 610 and 611.

At the end of the first Quarter of residence study all candidates for advanced degrees must pass a departmental examination, including general, organic, and quantitative chemistry.

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

601. General Biological Chemistry. Three credit hours. One Quarter. Autumn, Winter, and Spring. Three lectures each week. General prerequisites must include a course in general agricultural biochemistry; or the equivalent in organic chemistry, together with five hours of biological science. Mr. Burrell, Mr. Deatherage, Mr. Varner.

A brief summary of the history and literature of biochemistry; the colloidal chemistry of biological materials; hydrogen ion concentration; the chemical composition of plants and animals with special reference to lipids, carbohydrates, proteins, and enzymes.

Not open for graduate credit to students majoring in Agricultural Biochemistry.

Not open to students who have credit for Agricultural Chemistry 601.

602. Official Methods of Analysis. Five credit hours. Spring Quarter. One lecture and twelve hours of laboratory practice each week. General prerequisites must include a course in general agricultural biochemistry or equivalent. Offered in alternate years. Mr. Almy.

A course designed to familiarize the student with methods used in the chemical analysis of foods and feeds as set forth in the Official Methods of the Association of Official Agricultural Chemists. Fundamental procedures applicable to analysis of cereal foods, milk products, animal feeds, etc., are studied both from the standpoint of the chemistry of the method and of interpretation of results of analyses.

603. Analysis of Dairy Products. Five credit hours. Winter Quarter. Two lectures and three three-hour laboratory periods each week. General prerequisites for Agricultural Biochemistry majors must include at least twelve hours of Agricultural Biochemistry including Agricultural Biochemistry 601 and 609; for Dairy Technology majors the general prerequisites must include

acceptable courses in Organic Chemistry and Quantitative Analysis, and at least twenty-five hours in Dairy Technology courses. Agricultural Biochemistry 602 is desirable as a preceding course. Offered in alternate years. Mr. Almy.

This course is designed for seniors and graduate students interested in research in Dairy Chemistry and Technology. It deals with procedures for quantitative determination of the organic and inorganic constituents of milk and dairy products.

***605. Advanced Dairy Chemistry.** Five credit hours. Spring Quarter. Three lectures and two three-hour laboratory periods each week. General prerequisites for Agricultural Biochemistry majors must include at least twelve hours of Agricultural Biochemistry including Agricultural Biochemistry 601 and 609; for Dairy Technology majors general prerequisites must include acceptable courses in Organic Chemistry and Quantitative Analysis, and at least twenty-five hours in Dairy Technology courses. Offered in alternate years. Mr. Almy.

This course is designed for seniors and graduate students interested in research in Dairy Chemistry and Technology. It deals with physico-chemical relations, colloidal phenomena, etc., in relation to milk and dairy products, and their applications in processing problems.

607. Chemistry of Nutrition. Five credit hours. Winter Quarter. Three lectures and two three-hour laboratory periods each week. General prerequisites must include Agricultural Biochemistry 601 and 609 or equivalent and acceptable courses in physiology, or equivalent. Mr. Moore.

Laboratory work includes analysis of a food for nutrients, mixing complete and incomplete synthetic diets, feeding an experimental animal a diet lacking a specified nutrient and a study of effects produced.

609. General Biological Chemistry: Laboratory. Three credit hours. One Quarter. Autumn, Winter, Spring. Two four-hour laboratory periods each week. General prerequisites must include a course in general agricultural biochemistry; or the equivalent in organic chemistry and quantitative analysis, together with five hours of biological science. This course should be taken concurrently with Agricultural Biochemistry 601. Mr. Burrell, Mr. Deatherage, Mr. Varner.

Experiments dealing with chemical equilibrium, chromatography, colloidal systems, hydrogen ion concentration, fat constants, identification of individual carbohydrates, a micro-Kjeldahl, Van Slyke-Cullen aeration, several experiments on rate of enzyme action; and a special problem in which certain unusual experimental techniques are applied to the preparation or isolation of some compound of biological importance.

Not open for graduate credit to students majoring in Agricultural Biochemistry.

Not open to students who have credit for Agricultural Chemistry 601.

***610. Horticultural Chemicals.** Five credit hours. Winter Quarter. Three lectures and two three-hour laboratory periods each week. General prerequisites must include a course in general agricultural biochemistry, or equivalent and fifteen hours of biological science. Undergraduates will be permitted to register for this course only on permission of the instructor. Offered in alternate years. Mr. Almy.

Organic and inorganic substances which are used in horticulture as insecticides, fungicides, growth hormones, etc., are studied.

701. Special Problems. Two to five credit hours. Autumn, Winter, and Spring Quarters. General prerequisites must include Agricultural Biochemistry 601 and 609 or equivalent and consent of the instructor. Offered at Columbus and at Wooster. All instructors.

Students electing this course must have had at least two five-hour courses in the department. Consent of the department must be secured.

713. Chemistry of Foods and Food Processing. Five credit hours. Winter Quarter. Three lectures and two three-hour laboratory periods each week.

* Not given in 1954-1955.

General prerequisites must include Agricultural Biochemistry 601 and 609, or equivalent. It is recommended that the student have or take concurrently Chemistry 647-648, 680 or 681. Mr. Deatherage.

Lectures cover the chemical, physical, and biological nature of foods in relation to handling, processing, packaging, quality and consumer acceptance. Laboratory will consist of selected experiments covering the functions of various food constituents, chemical and physical changes during cooking and processing, and elements of consumer acceptance in relation to food chemistry and technology.

Not open to students who have credit for Agricultural Biochemistry 613.

721. Chemistry of the Vitamins. Three credit hours. Spring Quarter. Three lectures each week. General prerequisites must include Agricultural Biochemistry 601 and 609, 607 or equivalent; or the equivalent in organic chemistry and quantitative analysis. Mr. Deatherage, Mr. Moore.

Lectures on the isolation, synthesis, natural distribution and the physiological role of the known vitamins.

Not open to students who have credit for Agricultural Biochemistry 621.

722. Chemistry of the Vitamins: Laboratory. Two credit hours. Spring Quarter. Two three-hour laboratory periods each week. General prerequisites must include one year of college physics, Agricultural Biochemistry 601 and 609 or equivalent, and prerequisite or concurrent Agricultural Biochemistry 721. Mr. Moore.

Determination of several of the vitamins by chemical and physical methods involving specialized techniques.

Not open to students who have credit for Agricultural Biochemistry 622.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

801. Plant Chemistry. Five credit hours. Spring Quarter. Two lectures and three three-hour laboratory periods each week. General prerequisites must include Agricultural Biochemistry 601 and 609 and Botany 605. Mr. Burrell.

The laboratory work includes a detailed, quantitative analysis of fresh plant tissue. The lectures and discussions center around: (1) a study of the chemical composition of plants in which "Official Methods" of analysis are reviewed and more recent methods evaluated; (2) a study of the results of such analyses with possible applications to the explanation of plant processes.

804. Seminar. One credit hour. Autumn, Winter, and Spring Quarters. Required of all graduate students majoring in agricultural biochemistry. Offered at Columbus and at Wooster.

805. Advanced Biochemical Preparations. Five credit hours. Winter Quarter. One lecture or conference and three four-hour laboratory periods each week. General prerequisites must include Agricultural Biochemistry 609, Chemistry 741 and permission of the instructor. Mr. Varner.

The isolation and preparation of compounds of biochemical interest in which special techniques are involved. Emphasis will be laid on practice in various types of methods including chromatographic and countercurrent separations. During the second half of the Quarter, the student will work on a special isolation or preparation adapted to his particular needs.

806. Enzymes. Five credit hours. Autumn Quarter. Three lecture and two three-hour laboratory periods each week. General prerequisites must include Agricultural Biochemistry 609 and acceptable course work in Physical Chemistry. Mr. Varner, Mr. Moore.

The chemical nature of enzymes and enzyme activity; factors influencing enzymic activity; classes of enzymes with a consideration of individually important enzymes; methods for the preparation and study of enzymes. Laboratory work includes the preparation of a pure enzyme; methods of measuring enzyme activity with instruction and practice in the use of special equipment and instruments used in enzyme study.

898. Interdepartmental Seminar in Nutrition and Food Technology. One credit hour. Spring Quarter. In cooperation between the Institute of Nutrition

and Food Technology and the several departments interested, a seminar will be conducted in nutrition and in the related field of food technology. Subject and staff will be announced each year after approval by the Graduate School.

950. Research in Agricultural Biochemistry. Autumn, Winter, and Spring Quarters. Laboratory, library, and conference work. General prerequisites required. Offered at Columbus and at Wooster. Mr. Deatherage, Mr. Sutton, Mr. Burrell, Mr. Almy, Mr. Brown, Mr. Moxon, Mr. Wolfson, Mr. Varner, Mr. Moore.

Research may be done in Nutrition, Plant Biochemistry, Animal Biochemistry, Enzyme Chemistry, Chemistry of Fats, Chemistry of Natural Products, Intermediary Metabolism, Food Chemistry and Technology, and Dairy Chemistry.

AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY

Office, 208 Townsend Hall

PROFESSORS SMITH, CRAY, FALCONER (EMERITUS), HENNING, MANGUS, OYLER, SITTERLEY, AND WERTZ, ASSOCIATE PROFESSORS CRAVENS, MOORE, AND SHERMAN, ASSISTANT PROFESSORS ANDREWS, BAUMER, BAKER, AND EVANS

Prerequisites for Graduate Work: General prerequisites include fundamental courses in economics or sociology.

Fields of study: The area of specialization within the department include: (1) Farm organization and management, (2) Marketing farm products, (3) Rural sociology, (4) Farm prices, land use, agricultural policy, farm taxation, farm finance.

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

AGRICULTURAL ECONOMICS

602. Advanced Farm Organization. Three credit hours. Autumn Quarter. Three lectures each week. Mr. Sitterley.

A more detailed and advanced consideration of the economic and management principles involved in analyzing, organizing, operating, and administering farms. A half day inspection trip will be taken to several farms which will be used as class problems.

603. Cooperation in Agriculture. Five credit hours. Winter Quarter. Five lectures each week. Mr. Henning.

A study of agricultural cooperation, mainly as found in the United States. The types of cooperative marketing, manufacturing and purchasing organizations, collective bargaining, cooperative credit and insurance.

605. Agricultural Policy. Three credit hours. Winter Quarter. Three lectures each week. Mr. Smith.

The importance of the agricultural industry to the welfare of the nation. Some characteristics of the farming industry. Foreign competition, present and prospective. State and federal regulations, encouragement and aid to agriculture in the United States and foreign countries.

610. Agricultural Finance. Three credit hours. Autumn Quarter. Three discussion periods each week. Mr. Wertz, Mr. Bailey.

Characteristics affecting credit needs of agriculture, kinds and sources of credit available. Farm investment programs, relationship between long and short time indebtedness, interest rates, terms of repayment and farm real estate prices.

612. Prices of Farm Products. Three credit hours. One Quarter. Winter and Spring. Three lectures each week. Mr. Wertz.

Prices received and paid by farmers, characteristics of farm product prices, index numbers, parity price, feeding ratios and other purchasing power ratios, seasonal variation of farm product prices, livestock cycles, demand elasticity and the influence of the general price level on the price of farm products.

613. Marketing Farm Products. Five credit hours. One Quarter. Autumn, Winter, Spring. Five lectures each week. Mr. Henning, Mr. Baumer.

A study of local and terminal marketing agencies involved in the marketing of farm products. A two-day field trip required.

Other Agricultural Marketing Courses

NOTE: The following marketing courses given in cooperation with other departments will be counted toward a major in Agricultural Economics:

Marketing Poultry Products. For description, see Poultry Science 620

Livestock Marketing. For description, Animal Science 608

Marketing of Dairy Products. For description, see Dairy Science 626

614. Business Management in Agricultural Marketing. Three credit hours. Spring Quarter. Two lectures and one laboratory period each week. Mr. Henning.

A detailed study of representative agricultural marketing agencies, including their problems of administration, finance, selling, transportation, and warehousing.

615. Land Economics. Three credit hours. Spring Quarter. Mr. Sitterley.

Our rural land resources and requirements, the economic principles involved in land use, our major land use problems, a consideration of ways of achieving a better land use, and the public's interest in a land policy.

616. Food Economics. Three credit hours. Spring Quarter. Three lectures each week. Mr. Sherman.

Economic aspects of the production, distribution and consumption of food.

618. Farm Appraisal. Three credit hours. Spring Quarter. Three lectures each week. Mr. Baker.

Methods of appraising farm property. Forces which affect farm real estate values.

628. The Marketing of Fruits and Vegetables. Five credit hours. Spring Quarter. Three lecture periods and the equivalent of one four-hour laboratory period each week. Mr. Cravens.

Special emphasis is given to the principles involved in the marketing of fruits and vegetables and the agencies concerned. One full day and at least two one-half day field trips are taken to acquaint students with the various agencies handling fruits and vegetables.

Not open to students who have credit for Horticulture 628.

633. Grain Marketing. Three credit hours. Autumn Quarter. Three class periods each week. General prerequisites must include ten hours of Economics (including Agricultural Economics), five hours of Mathematics, and five hours of either marketing including Agricultural Marketing), or grain crops in Agronomy. Mr. Sharp.

Principles and practices involved in grain marketing and the theory of grain pricing. Economic analysis of future pricing and trading, hedging, market grades, grade differentials, discounts, and basis of sale. Economics of storage, current development and trends affecting grain marketing.

710. Agricultural Economics. Three credit hours. Autumn Quarter. Three class meetings each week. Prerequisite, fifteen hours in Agricultural Economics and senior standing. Mr. Smith.

This course is designed to provide a critical consideration of economic principles as they apply to problems of agriculture.

RURAL SOCIOLOGY

606. Rural Sociology. Five credit hours. Winter Quarter. General prerequisites must include ten hours of sociology, rural sociology, or the equivalent with permission of the instructor. Given in alternate years. Mr. Mangus.

A general course in the sociology of rural life. Emphasizes the fundamental and conditioning factors in rural social development, rural social institutions, and the nature of rural social organization.

609. Rural Social Organization. Three credit hours. Autumn Quarter. Three class periods each week. General prerequisites must include ten hours of Sociology, Rural Sociology or the equivalent with permission of the instructor. Mr. Andrews.

The structure and function of rural groups, including organizational and informal relationships. The process of making decisions and policy for community development through agricultural extension, school systems, churches and other agencies. Students will make an analysis of a rural organization or community.

611. Rural Youth Social Adjustment. Four credit hours. Autumn Quarter. General prerequisites must include ten hours of sociology, rural sociology or the equivalent with permission of the instructor. Mr. Mangus.

Personal and social adjustment problems of rural young people in achieving moral, marital and economic maturity.

SPECIAL PROBLEMS

AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY

701. Special Problems. Two to five credit hours. Autumn, Winter, and Spring Quarters. General prerequisites must include at least eight hours of work in the department and the consent of the instructor must be obtained. Mr. Smith, Mr. Henning, Mr. Wertz, Mr. Sitterley, Mr. Mangus, Mr. Sherman, Mr. Baumer, Mr. Baker, Mr. Andrews, Mr. Cravens, Mr. Evans.

This course is for students who desire to work out special problems in the field of rural economics and rural sociology.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

802. Agricultural Economics Seminar. Two credit hours. Winter Quarter. Consent of the instructor must be obtained. Mr. Smith and staff.

803. Seminar in Marketing Farm Products. Two credit hours. Spring Quarter. General prerequisites must include consent of the instructor. Mr. Henning, Mr. Sherman, Mr. Baumer.

810. Research Methods in Agricultural Economics. Two credit hours. Spring Quarter. One two-hour class meeting each week. Courses in philosophy, statistics, and advanced courses in economics and agricultural economics are desirable before taking this course. Staff.

Planning, and methods of analysis used in, research in Agricultural Economics.

950. Research in Agricultural Economics and Rural Sociology. Autumn, Winter, and Spring Quarters. Opportunity is offered to carry on special research in agricultural economics and rural sociology. Mr. Smith, Mr. Henning, Mr. Wertz, Mr. Sitterley, Mr. Mangus, Mr. Baumer, Mr. Andrews, Mr. Cravens, Mr. Evans.

AGRICULTURAL EDUCATION

Office, 100 Rehearsal Hall

PROFESSORS BENDER AND STEWART, ASSOCIATE PROFESSOR WOODIN, ASSISTANT PROFESSOR WOLF, MR. RITCHIE, MR. WILSON

Prerequisites for Graduate Work: A student seeking to enter upon graduate work in the field of Agricultural Education should have had at least one year of successful experience as a teacher of vocational agriculture. Those not meeting this qualification must secure special permission from the departmental graduate committee.

Areas of Specialization: A balanced and integrated program of graduate study for each student is developed as follows:

1. For the Master's Degree: In addition to major work in Agricultural Education, one other area must be included, either in education or in agriculture.

2. For the Ph.D. Degree: In addition to major work in Agricultural Education, at least three other areas of specialization must be included. At least two of these areas must be in education and/or in agriculture.

Departmental Requirements for the Degrees Master of Arts, Master of Science, and Master of Education:

(See page 38 for the general requirements for the degrees Master of Arts and Master of Science. The general requirements for the degree Master of Education will be found on page 41.)

The distribution of hours of credit toward the Master of Arts or Master of Science degrees is subject to the following limitations:

a. A minimum of 20 hours in Agricultural Education

- b. A minimum of 6 hours outside the department, either in education or in Agriculture
- c. A maximum of 15 hours in Special Problems and Research in Agricultural Education

The distribution of hours of credit for the Master of Education degree is subject to the following limitations:

- a. A minimum of 20 hours and a maximum of 35 hours in Agricultural Education
- b. A minimum of 12 hours in Education and/or Psychology with at least 6 in Education
- c. A maximum of 20 hours in Special Problems, Practicums and Research study in Agricultural Education

Requirements for the Ph.D. Degree: As soon as feasible after the designation of a permanent departmental adviser, an advisory committee is appointed. The advisory committee of which the departmental adviser is chairman, then guides the student in arranging to meet the various requirements for the degree.

FOR GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

611. Teaching Aids for Vocational Agriculture. Three credit hours. Spring Quarter. Two discussion periods and one laboratory period each week. Mr. Woodin.

Using teaching aids in a program of vocational agriculture including the selection of equipment and materials as well as demonstrations and practice in their use in teaching.

701. Special Problems. Two to five credit hours. Autumn, Winter and Spring Quarters. Staff.

Planning, conducting and reporting a special problem in agricultural education appropriate to the needs of the student.

705. Farming Programs for High School Students. Three credit hours. Autumn Quarter. Three discussion periods each week. General prerequisite must include teaching experience in vocational agriculture or permission of the instructor. Mr. Woodin.

Selecting, planning, conducting and evaluating farming programs for high school students of vocational agriculture, with emphasis on principles and procedures which teachers may employ in the development of such programs.

†707-*708-†709. Curriculum in Vocational Agriculture. Four credit hours each. First term, Summer Quarter. Four two-hour discussion laboratory periods each week. General prerequisites must include teaching experience in vocational agriculture or permission of the instructor. Mr. Wolf.

The principles and practices in the development of program of instruction for various classes in vocational agriculture adapted to local interests and needs. Each course, which is an independent unit, gives emphasis to selection of subject matter content and teaching procedures.

†707. Teaching Crop and Livestock Production.

*708. Teaching Farm Mechanics.

†709. Teaching Agricultural Economics and Farm Management.

712. Future Farmers of America. Three credit hours. Spring Quarter. Three discussions periods each week. General prerequisites must include teaching experience in vocational agriculture or permission of the instructor. Mr. Bender.

An analysis of the Future Farmers of America organization in terms of its contribution to the education of farm boys with special consideration of the problems in planning and conducting local programs.

Not open to students who have credit for Agricultural Education 612.

715. Adult Education in Agriculture. Three credit hours. Autumn Quarter. Three discussion periods each week. General prerequisites must include teaching experience in vocational agriculture or permission of the instructor. Mr. Bender.

Principles and practices appropriate to the solution of problems encountered in developing and conducting instructional programs for young and adult farmers.

Not open to students who have credit for Agricultural Education 808.

* Not given in 1954-1955.

† Not given during the academic year, 1954-1955.

†799. Workshop—Program Planning in Vocational Agriculture. Four credit hours. May be repeated for a maximum of eight credit hours. Three weeks full time, Summer Quarter.

Objectives and methods of local program planning applied to those areas of need as expressed by the teachers. Special attention will be devoted to the appraisal of student needs and the use of community resources.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

803. The Problem Method in Teaching Agriculture. Five credit hours. Winter Quarter. Five discussion periods each week. General prerequisites must include teaching experience in vocational agriculture or permission of the instructor. Mr. Stewart.

Conditions that promote effective teaching with a determination of procedures that contribute to this end; use of the problem method in agricultural education as applied to secondary and college teaching.

*804. State Administration and Supervision of Vocational Agriculture. Three credit hours. Three discussion periods each week. General prerequisites must include teaching experience in vocational agriculture or permission of the instructor. Mr. Bender.

Development and operation of the state program of vocational agriculture; objectives, standards and evaluative procedures; particular attention given to federal-state-local relationships, promotion of the program, in-service teacher education, and administrative practices.

†806. Teacher Education for Vocational Agriculture. Three credit hours. Three discussion periods each week. General prerequisites must include teaching experience in vocational agriculture or permission of the instructor. Mr. Bender.

Principles and methods suited to the development of teacher-education programs for vocational agriculture, with emphasis upon selection and guidance of students, curriculum, placement, in-service education, and research.

†807. Evaluation and Measurement in Vocational Agriculture. Three credit hours. Three discussion periods each week. General prerequisites must include teaching experience in vocational agriculture or permission of the instructor. Mr. Woodin.

Development of objectives and formulation of evaluative and measuring devices in vocational agriculture with particular attention to recent progress in the evaluation of teaching including the use of citizens' committees.

810. Seminar in Agricultural Education. One to five credit hours. Autumn, Winter, and Spring Quarters. Staff.

Investigation and discussion of current problems and research in agricultural education.

835. Advanced Studies in Agricultural Education. Three credit hours. Autumn, Winter and Spring Quarters. Limited to graduate students pursuing the Master of Education Degree program. Staff.

Designed primarily to enable students to demonstrate competence in planning, conducting and reporting a field service study in agricultural education.

†850. Research Methods in Agricultural Education. Three credit hours. General prerequisites must include at least 8 hours of graduate work or permission of the instructor. Three discussion periods and one conference period each week. Mr. Stewart.

Principles of investigational procedure and criteria for evaluating research. Exploration of methods and techniques appropriate for planning, organizing, and conducting research in Agricultural Education.

950. Research in Agricultural Education. Autumn, Winter, Spring. Permission of the instructor must be obtained. Staff.

Research in all phases of agricultural education.

† Not given during the academic year, 1954-1955.

* Not given in 1954-1955.

AGRICULTURAL ENGINEERING

Office, 105 Ives Hall

PROFESSORS McCUEN, MILLER, OVERHOLT, BARDEN, AND KENNEDY

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

The general prerequisites include fundamental courses in agricultural engineering, agronomy, mathematics, and physics.

600. Farm and Home Safety. One credit hour. Spring Quarter. Mr. McCuen and staff.

A conference hour to discuss causes of accidents and formulate methods for conducting farm and home safety programs. The seminar is designed for students interested in vocational agriculture, home economics, county extension, service conservation, and farm organization work.

605. Advanced Farm Power and Field Machinery. Five credit hours. Spring Quarter. Three one-hour recitations and two two-hour laboratory periods each week. Mr. Barden, Mr. Warner.

An advanced study of soil-working, planting, and forage-handling machines from the mechanical, operational, and economic standpoint; including a term problem relating to machinery, power, and labor program on the student's home (or other) farm.

612. Farm Structures Design. Five credit hours. Winter Quarter. Three recitations and two two-hour laboratory periods each week. General prerequisites must include Mechanics 602. Mr. Miller.

Design of farm building programs for farms, coordinating the engineering, agricultural and social science factors. The design and details of construction for building units and the entire farmstead. Laboratory tests in sanitary features such as ventilation, water supply and heating factors.

613. Advanced Farm Power Equipment. Five credit hours. Autumn Quarter. Three one-hour recitations and two two-hour laboratory periods each week. General prerequisites must include Agronomy 617 and 618, Mechanics 607. Mr. Lamp.

A study of the use and design of agricultural production equipment. Power requirements of modern production implements will be made under field conditions using special dynamometer equipment for belt, power-take-off, and draw bar power studies.

617. Advanced Mechanical Control of Farm Water. Five credit hours. Spring Quarter. Three one-hour recitations, two two-hour laboratory periods each week. General prerequisites must include Agronomy 617 and 618, Mechanics 610. Mr. Overholt.

Advanced study of water and soil regulation by engineering methods. Will include the design and operation of soil and water conservation structures, controlled land drainage and irrigation, based upon balanced engineering and economic factors.

701. Special Problems. Two to five credit hours. Autumn, Winter, and Spring Quarters. Mr. McCuen and staff.

This course is intended for advanced undergraduates and graduate students who are interested in working out problems not included in regular courses offered by the department. The selection of special problems in advanced phases of agricultural engineering must have the consent of the department.

702-703. Advanced Engineering Problems in Agriculture. Three or five credit hours. Autumn, Winter, and Spring Quarters. All instructors.

Students in this course must have had the "600" in line with the problem to be studied and be approved by the adviser in the option selected.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

950. Research in Agricultural Engineering. Autumn, Winter, and Spring Quarters. Library, conference, and laboratory work. Permission of the department required. Mr. McCuen, Mr. Miller, Mr. Overholt, Mr. Barden.

AGRICULTURAL EXPERIMENT STATION

Wooster, Ohio

In recognition of the mutual objectives and research interests in the sciences contributing to the understanding and progress of agriculture, the Board of Trustees of The Ohio State University and the Board of Control of the Ohio Agricultural Experiment Station have authorized a co-operative program of graduate study and research.

1. Approved graduate seminars and research courses will be offered at the Ohio Agricultural Experiment Station as well as at The Ohio State University.

2. Courses which are to be offered both at the Ohio Agricultural Experiment Station and at The Ohio State University have been announced in the regular manner among the offerings of the appropriate department with the statement "Offered both at Columbus and at Wooster."

3. Members of the staff of the Ohio Agricultural Experiment Station are authorized to offer graduate courses and to act as advisers to graduate students, provided they satisfy the criteria of the Graduate Council and are approved by the graduate committee and the chairman of the appropriate department.

4. The rules of the Graduate School concerning residence credit will apply to students in residence at the Ohio Agricultural Experiment Station in the same way in which they apply to graduate students in residence on the campus of the University.

5. The graduate program of a student in residence at the Ohio Agricultural Experiment Station will be reviewed and approved by the graduate committee of the appropriate department just as if these students were on the University campus.

6. Graduate students anticipating credit for work done at the Experiment Station are required to register each Quarter and pay the usual fees assessed by the University.

This co-operative agreement makes available the advisory personnel and the extensive research facilities of the Ohio Agricultural Experiment Station as an integral part of the Graduate School.

For graduate courses offered at the Ohio Agricultural Experiment Station, reference is made to those departmental courses which include the insertion—"Offered at Columbus and at Wooster."

AGRICULTURAL EXTENSION

Office, 124 Townshend Hall

PROFESSORS WOOD AND CROY, ASSOCIATE PROFESSOR ROBINSON

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

701. Special Problems. Two to five credit hours. Autumn, Winter, and Spring Quarters. Permission of the instructor is required. Mr. Croy.

This course is intended for graduates who wish to consider problems in Agricultural Education including Agricultural Extension and Vocational Education in Agriculture.

726. Agricultural Extension Workshop. Four credit hours for three-week workshop. Winter Quarter. Full time of students required, therefore registrants not permitted to take other University work concurrently. Open only to persons employed as Extension workers or about to be employed who in the judgment of the committee on workshops have an educational background in the subject matter of the workshop which will serve as an adequate base for intensive work in this field. Permission of instructor required.

Students registered for the course will be required to submit individual papers covering in detail their contributions to the total workshop problem.

AGRONOMY

Offices, 102 Horticulture Building and 203A Townshend Hall

PROFESSORS VOLK, DODD, LAMB, MARTIN, PARK (EMERITUS), AND WILLARD,
ASSOCIATE PROFESSORS HOLOWAYCHUK, SABOE AND SALTER (EMERITUS)
ASSISTANT PROFESSORS FINKNER, JEFFERS, PRATT, AND TAYLOR

OHIO AGRICULTURAL EXPERIMENT STATION RESEARCH ASSOCIATES BARNES,
HAYNES, STRINGFIELD, AND SAYRE

Research in Agronomy is concerned with fundamental investigations of the physical, chemical and biological processes and responses in soils and in field crops, and with the organization of the findings into scientific systems of soil management and of crop production. Suggested areas of graduate specialization are: soil fertility, soil management, soil chemistry, soil physics, physical chemistry of soils, soil biology, soil genesis and morphology, soil conservation, field crop management, seed production, field crop ecology, field crop physiology, field crop breeding, weed control, and experimental methods in agronomy.

Prerequisites for Graduate Work: A student proposing to major in agronomy should have exhibited high undergraduate scholarship in such basic sciences as mathematics, chemistry, agricultural chemistry, physics, botany, genetics, and geology. If the undergraduate training is inadequate in any science fundamental to the proposed area of specialization, it will be necessary to make up the deficiency. A candidate for admission to graduate work in agronomy will find it advantageous to have a working knowledge of soils and field crops, though he need not have specialized in agronomy as an undergraduate.

Requirements for the Master's and Ph.D. Degrees: Each graduate student is required to prepare a statement of his proposed research according to the outline used for projects of the agricultural experiment stations. Once a year a progress report of the research, together with any modifications or revisions of the original project outline, is to be submitted to the departmental committee on graduate instruction.

Programs of candidates for the doctorate must be approved by the departmental committee on graduate instruction. Candidates for the doctorate are expected to audit Agronomy 501, 510, and 512, unless these courses or their equivalents have been taken previously.

Cooperation with the Ohio Agricultural Experiment Station: Association with the Ohio Agricultural Experiment Station provides facilities for laboratory and greenhouse investigations at Wooster as well as at Columbus and for field experiments at Wooster, Columbus, and at thirteen district and county experiment farms. Most of the graduate advisers in agronomy are also members of the staff of the Agricultural Experiment Station; several are full-time members.

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

601. Organization of Soil and Crop Management Systems. Five credit hours. One Quarter. Autumn and Winter. Three lectures and two discussion periods each week. Mr. Willard.

Recognizing, correlating and solving soil and crop problems relating to the improvement of soil resources and to efficient production and use of field crops. Practical application of chemical, physical, biological, and economic information and experience to the building of soil and crop management systems for various types of farming.

603. Origin and Classification of Soils. Five credit hours. Spring Quarter. Four lectures and one three-hour laboratory period each week. Mr. Holowaychuk.

The characteristics of soils as developed under various climatic conditions and their application in soil classification with special reference to Ohio conditions. Laboratory study of soil characteristics, field trips to several of the important soil areas in Ohio.

604. Soil Erosion and Its Control. Five credit hours. Autumn Quarter. Four lectures and one three-hour laboratory period each week. Mr. Holowaychuk.

A study of the nature, causes, occurrences and economic importance of soil erosion, and of the methods and agencies for its control. Field trips for study of erosion in different regions of the state with visits to erosion experiment station and demonstration control areas.

***607. Field Crop Breeding.** Five credit hours. Winter Quarter. Three lectures and two two-hour laboratory periods each week. Given in alternate years. In addition to the general prerequisites, a course in botany and a course in heredity. Mr. Saboe.

* Not given in 1954-1955.

Application of the science of genetics and the art of plant breeding to the improvement of field crops. Studies of the basic principles and methods used in the production of superior varieties, strains, and hybrids of agronomic crops. Attainments and prospective development in these fields. Brief consideration of the elements of field plot technique and mathematical analyses used in breeding work.

610. Weed Control. Three credit hours. Autumn Quarter. Three lectures each week. Mr. Willard.

A comprehensive study of losses due to weeds, how weeds injure crops, how they are introduced and spread, and their control by tillage, chemicals, insects, plant competition, and soil sterilization.

611. Soil Fertility. Three credit hours. One Quarter. Autumn and Winter. Three one-hour lecture periods each week. Mr. Salter.

A study of the various factors affecting soil productivity and the practices needed in good soil management. Consideration is given to the significance of cultivation, drainage, rotations, organic matter maintenance and the use of manures, fertilizers and liming materials.

615. Soil Microbiology. Three credit hours. Winter Quarter. Three lectures each week. General prerequisites must include Bacteriology 607 or equivalent. Mr. Martin.

A study of the morphology and character of microorganisms, and of their biochemical transformations, such as nitrogen fixation, ammonia oxidation, nitrate reduction, and oxidation of organic materials with emphasis upon soil fertility relationships.

Not open to students who have credit for Agronomy 605.

616. Soil Microbiology: Laboratory. Two credit hours. Winter Quarter. Two three-hour laboratory periods each week. Agronomy 615 must be included in the general prerequisites or taken concurrently. Mr. Martin.

Laboratory work on the identification of soil microorganisms and their functions in soil.

Not open to students who have credit for Agronomy 605.

617. Soil Physics. Three credit hours. Autumn Quarter. Three lecture periods each week. Mr. Taylor.

A study of the physical makeup and properties of soil, including structure, thermal relationships, consistency, plasticity, water and air relationships.

Not open to students who have credit for Agronomy 608.

618. Soil Physics: Laboratory. Two credit hours. Autumn Quarter. Two three-hour laboratory periods each week. Agronomy 617 must be included in the general prerequisites or taken concurrently. Mr. Taylor.

Laboratory work will be a study of the physical composition of soils involving plasticity and consistency measurements, aggregate analysis, waterholding capacity, airspace and capillary measurements and mechanical analysis.

Not open to students who have credit for Agronomy 608.

620. Pastures and Pasture Management. Three credit hours. Winter Quarter. Three lecture periods each week. General prerequisites must include a course in soils and forage crops or the consent of the instructor. Mr. Jeffers.

A course designed to meet the needs of students requiring more detailed knowledge of pasture production than is given in Agronomy 503. Special emphasis on management, maintenance and fertility practices for the important forage species in rotation and permanent pastures.

640. Field Crop Ecology. Three credit hours. Winter Quarter. Three lectures each week. In addition to the general prerequisites, Botany 601 or equivalent and permission of the instructor are required. Mr. Willard.

A study of the relationship of crop plants to climate, soils, and other limiting factors of distribution, production, and quality.

701. Special Problems. Two to five credit hours. Autumn, Winter, and Spring Quarters. The consent of the instructor is required. Offered at Columbus and Wooster. The staff.

Eligible students may select special problems, not included in regular courses, and involving library, laboratory or field studies in soil fertility, soil management, soil chemistry, soil physics, soil biology, soil classification and mapping, soil conservation, field crop management, seed production, field crop breeding, construction and management of turf areas, weed control, and experimental methods in agronomy.

712. Chemistry of Soils and Fertilizers. Five credit hours. Winter Quarter. Three one-hour lecture periods and two three-hour laboratory periods each week. General prerequisites must include Agronomy 611, or the equivalent, one Quarter of quantitative analysis, and permission of the instructor. Mr. Pratt.

A study of the chemical properties of soils and fertilizers which affect plant growth and composition. The laboratory consists of a study of laboratory methods and making soil and fertilizer analyses.

Not open to students who have credit for Agronomy 612.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

801. Agronomy Seminar. Three credit hours. Autumn, Winter, and Spring Quarters. The consent of the instructor is required. Offered at Columbus and at Wooster.

Topics for 1954-1955:

Autumn Quarter: Advanced Soil Chemistry. Mr. Pratt.

Winter Quarter: Analysis of Field Experiments. Mr. Finker.

Spring Quarter: Soil Genesis. Mr. Holowaychuk.

805. Physical Chemistry of Soils. Five credit hours. Winter Quarter. Three lectures and two three-hour laboratory periods each week. General prerequisites must include acceptable courses in physical and colloidal chemistry and Agronomy 608. Mr. Taylor.

Application of physical chemistry to soils with particular emphasis on the colloidal properties and reactions of clays and organic matter. Properties of the clay minerals, base exchange, soil acidity, and mechanics of ionic transfer and availability in plant nutrition are discussed.

***807. Techniques of Experimental Design.** Five credit hours. Spring Quarter. Five lectures each week. Given in alternate years. General prerequisites must include Zoology 630 or its equivalent. Mr. Martin.

A course in the design of experiments and the application of statistical methods to the interpretation of experimental data. The use of the incomplete block designs, including lattices, and lattice squares, as well as the more common designs will be studied, and illustrative problems assigned. Consideration will also be given to interpretation of factorial experiments, the use of correlation and regression methods, and the design of sampling schemes.

810. Advanced Field Crop Breeding. Five credit hours. Winter Quarter. Three lectures and two two-hour laboratory periods each week. General prerequisites must include Zoology 618 and 630, or equivalent, ten hours of botany, ten hours in grain and forage crops, or equivalent. Given in alternate years. Mr. Finkner.

Detailed consideration of the methods used in the improvement of specific agronomic crops, with an historical background and discussion of the genetic theory involved. Problems of planning a breeding program, including field plot technique. Means of assuring effective distribution and intelligent use of new and improved strains.

950. Research in Agronomy. Autumn, Winter, and Spring Quarters. Offered at Columbus and at Wooster.

Research in soil fertility, soil management, soil chemistry, soil physics and physical chemistry, soil biology, soil genesis and morphology, and soil conservation under the direction of Mr. Salter, Mr. Volk, Mr. Martin, Mr. Barnes.

Research in field crop breeding, field crop management, seed production, weed control, field crop ecology, field crop physiology, and experimental methods in Agronomy, under the direction of Mr. Willard, Mr. Stringfield, Mr. Sayre, Mr. Lamb, Mr. Haynes, Mr. Dodd.

AMERICAN HISTORY

(See History)

* Not given in 1954-1955.

ANATOMY

Office, 414 Hamilton Hall

PROFESSORS KNOUFF, BAKER, EDWARDS, AND PALMER, ASSOCIATE PROFESSORS
GRAVES, LEACH, AND HAYES, ASSISTANT PROFESSOR GERSTEN

General prerequisites for graduate work in anatomy:

1. An undergraduate major in anatomy or its equivalent is the minimum requirement for graduate work in the Department. The College of Arts and Sciences requires a minimum of 40 Quarter hours in the major field during the last two years in college and permits a maximum of 60 hours in the major field.

2. The course requirements for an undergraduate major in anatomy, of which 25 hours must be in Anatomy, are as follows:

- a. Required courses
Anatomy 613, 616, 619
- a. Elective courses in anatomy
Anatomy 617, 604, 701, 611, 650
- c. Elective courses in allied fields
Physiology 506, 507, 601, 602, 625, 628, 630, 645, 646
Bacteriology 607, 608, 619, 654, 659
Zoology 603, 609, 610, 605, 617, 618, 620, 629, 630
Psychology 601, 602, 603, 624
Sociology 501, 502, 820, 700c
Physiological Chemistry 611, 612, 613

Students from schools other than Ohio State University should evaluate their offerings in terms of the courses listed above. No graduate credit in the Department of Anatomy is given for Anatomy 613, 616, or 619. Graduate credit is given for courses in the B group which have not been used to fulfill the requirements for an undergraduate major.

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

604. Anatomical Methods. Two to five credit hours. One Quarter. Autumn and Spring. One conference and the equivalent of two to eight laboratory or study hours each week. Mr. Hayes.

This course is designed for those students desiring to begin investigative work in the field of anatomy.

A study of the various techniques employed in anatomical research. Permission of the instructor must be secured.

611. Comparative Histology. Five credit hours. Autumn Quarter. Two lectures and nine laboratory hours each week. General prerequisites must include Anatomy 616, or Zoology 617 and 620. Enrollment is limited to twenty-five students and the permission of the instructor is required. Mr. Knouff.

A general consideration of the fundamental animal tissues. Available invertebrate material will be examined although special emphasis will be placed on the vertebrate forms.

613. Comparative Anatomy of the Vertebrates. Five credit hours. Autumn Quarter. Two lectures or recitations and six laboratory hours each week. General prerequisites must include elementary courses in zoology. Mr. Leach.

The comparative anatomy of the elasmobranchs, amphibians, and mammals as illustrated by the shark, frog, and fetal pig.

616. Comparative Vertebrate Embryology. Five credit hours. Spring Quarter. Three lectures or recitations and six laboratory hours each week. General prerequisites must include Anatomy 619 or its equivalent. Mr. Knouff, Mr. Belt.

The development of the chick and pig with special emphasis on fetal membrane formation and organogenesis.

617. Elementary Neurology. Five credit hours. Winter Quarter. Two lectures or recitations and nine laboratory hours each week. General prerequisites must include Anatomy 611 and permission of the instructor. Mr. Knouff.

A brief review of the brain and cranial nerves of the shark; the morphology of the spinal cord and brain of a mammal; the principal tracts and nuclei (reaction systems) of the cord and brain with special reference to the human nervous system.

619. Comparative Anatomy of the Vertebrates. Five credit hours. Winter Quarter. Two lectures or recitations and six laboratory hours each week. General prerequisites must include Anatomy 613 or equivalent. Mr. Leach.
The anatomy of the mammals with special reference to the cat.

621-622. Human Anatomy. Five credit hours. Autumn and Winter Quarters. Three lectures or recitations and nine laboratory hours each week. Mr. Baker, Mr. Graves, Mr. Gersten, Mrs. I. Eglitis, and assistants.

The gross anatomy of the extremities and the thorax, abdomen and perineum. The regional dissection is supplemented by body sections, and demonstrations of roentgenograms, special models and motion picture films.

Open only to students in Medicine and to students doubly registered in the College of Medicine and the Graduate School.

623. Human Anatomy. Three credit hours. Spring Quarter. Two lecture or conference hours and four laboratory hours each week. Mr. Baker, Mr. Graves, Mr. Gersten.

The gross anatomy of the head and neck.

Open only to students in medicine and to students doubly registered in the College of Medicine and the Graduate School.

624. Histology. Five credit hours. Autumn Quarter. Three lecture and conference hours, and nine laboratory hours each week. Open only to students in medicine and to students doubly registered in the College of Medicine and the Graduate School. Mr. Knouff, Mr. Hayes, Mr. Alpert, Mr. J. Eglitis.

The general histology of epithelial, connective, blood, and nervous tissues and the vascular system.

625. Histology. Five credit hours. Winter Quarter. Three lecture and conference hours and nine laboratory hours each week. Open only to students in medicine and to students doubly registered in the College of Medicine and the Graduate School. Mr. Knouff, Mr. Hayes, Mr. J. Eglitis.

Special histology and embryology of the integumentary, digestive, respiratory, urogenital, and endocrine systems.

626. Neuro-Anatomy. Five credit hours. Spring Quarter. Three lecture and conference hours and nine laboratory hours each week. Open only to students in medicine and to students doubly registered in the College of Medicine and the Graduate School. Mr. Palmer.

The gross anatomy and histology of the nervous system including sense organs with special reference to the reaction systems.

627. Clinical Anatomy. Two credit hours. Spring Quarter. Two lectures or recitations and one laboratory hour each week. General prerequisites must include Anatomy 621, 622, and 623. Open only to students in medicine and to students doubly registered in the College of Medicine and the Graduate School. Mr. Graves.

Topographical and regional aspects of human anatomy as displayed by prepared sections, special dissections, museum demonstrations, and roentgenograms, with special reference to the correlation of structure and clinical manifestations.

Not open to students who have credit for Anatomy 700.

628. Special Advanced Anatomy. Three credit hours. One Quarter. Autumn, Winter, Spring. One conference or lecture and six laboratory hours each week. General prerequisites must include Anatomy 623 or 632 or 638, 639. The consent of the instructor is required. Open only to students registered in the College of Medicine or Dentistry and to students doubly registered in the College of Medicine or Dentistry and the Graduate School. Mr. Baker, Mr. Edwards, Mr. Graves, Mr. Gersten.

Students will select or have assigned to them special regions for dissection and study.

630. Neurology. Three credit hours. Spring Quarter. Two lectures or recitations and three laboratory hours each week. Open only to students registered in Dentistry and to students doubly registered in the College of Dentistry and the Graduate School. Mr. Edwards.

The gross and microscopic structure of the brain and spinal cord, and the histology of the eye and ear. Emphasis is placed on the general principles of neurology.

638. Human Anatomy. Five credit hours. One Quarter. Autumn and Winter. Three lectures and six laboratory hours each week. Mr. Edwards and assistants.

The gross anatomy of the abdomen with emphasis on descriptive, topographical, and applied visceral anatomy, and of the lower extremity.

Open only to students registered in Dentistry and to students doubly registered in the College of Dentistry and the Graduate School.

639. Human Anatomy. Seven credit hours. One Quarter. Autumn and Winter. Four lectures and nine laboratory hours each week. Mr. Edwards and assistants.

The gross anatomy of the thorax, upper extremity and head and neck with special stress on osteology of the skull, muscles of mastication, trigeminal nerve, temporomandibular joint and oral cavity.

Open only to students registered in Dentistry and to students doubly registered in the College of Dentistry and the Graduate School.

640. Histology. Six credit hours. Spring Quarter. Three lectures and nine laboratory hours each week. Mr. John Eglitis, Mr. Hayes, and assistants.

The general histology of the tissues and the special histology of the integumentary, skeletal, vascular, digestive, respiratory, urogenital and nervous systems.

Open only to students registered in Dentistry and to students doubly registered in the College of Dentistry and the Graduate School.

641. Applied Anatomy. One credit hour. Autumn Quarter. One lecture each week. General prerequisites must include Anatomy 631, 632, 633, or 638, 639, 640. Open only to students in Dentistry and to students doubly registered in the College of Dentistry and the Graduate School. Mr. Edwards.

The anatomy of the head and neck as applied to Clinical Dentistry.

650. A Survey of Anatomy. Five credit hours. Spring Quarter. Two lectures, one discussion period and six laboratory or library hours each week. General prerequisites must include four Quarters in Anatomy. Mr. Edwards.

The objectives of this course are first to survey the history and development of anatomical knowledge and second, to correlate the subject matter of anatomy and associate major advances in the field of anatomy with the leading investigators. Present day trends in anatomical research will be discussed and an attempt made to introduce students to accepted procedures in original investigation.

701. Minor Problems in Anatomy. Two to five credit hours. Autumn, Winter, and Spring Quarters. One conference and two to eight laboratory and/or library hours each week. General prerequisites must include the equivalent of a major in anatomy or allied departments. The staff.

This course is designed to permit any properly qualified person to avail himself of the library and laboratory facilities of the department for carrying out a minor investigation or for adding to his knowledge and skill in some anatomical field.

721-722-723. Primate Anatomy. Five credit hours. Autumn, Winter, and Spring Quarters. Two lectures or recitations and ten laboratory hours each week. Permission of the instructor is required. Mr. Baker, Mr. Edwards, Mr. Graves, Mr. Gersten.

A regional and systemic study of the primate body for advanced students of Comparative Morphology with special reference to the ontogenetic and phylogenetic history of the organ systems.

724. Advanced Mammalian Histology. Five credit hours. Autumn Quarter. Three conference, and nine laboratory hours each week. Permission of instructor is required. Mr. Knouff, Mr. Hayes, Mr. J. Eglitis.

The general histology of epithelial, connective, blood, and nervous tissues and the vascular system.

725. Advanced Mammalian Histology. Five credit hours. Winter Quarter. Three conference, and nine laboratory hours each week. Permission of instructor is required. Mr. Knouff, Mr. Hayes, Mr. J. Eglitis.

The special histology and embryology of the integumentary, digestive, respiratory, urogenital, and endocrine systems.

726. Neurology. Five credit hours. Spring Quarter. Three conference, and nine laboratory hours each week. Permission of the instructor is required. Mr. Palmer.

The subject matter included in this course is chiefly concerned with the gross morphology, microscopic structure and the reaction systems of the primate nervous system and sense organs.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

807. Special Problems in Anatomy. Credit hours to be arranged. Autumn, Winter, and Spring Quarters. Permission of the instructor is required.

The student will select or be assigned special topics in one of the following fields of Anatomy:

- (a) Problems in endocrinology. Mr. Knouff, Mr. Hayes.
- (b) Special studies in blood and connective tissues. Mr. Knouff, Mr. Hayes.
- (c) Special studies in embryology. Mr. Knouff, Mr. Edwards, Mr. Hayes.
- (d) Advanced comparative morphology. Mr. Edwards, Mr. Leach.
- (e) Problems in microscopic anatomy. Mr. Knouff, Mr. Hayes.
- (f) Special studies in neurology. Mr. Palmer.

830. Anatomy Seminar. One credit hour. Autumn, Winter, and Spring Quarters. Required of all candidates for the Doctor's degree in anatomy during the second year in the Graduate School and thereafter. The staff.

This course consists of discussions of research in progress and reports from the literature of current anatomical problems.

950. Research in Anatomy. All Quarters. General prerequisites must include the equivalent of a major in anatomy, including Anatomy 604 and 701. The staff.

ANCIENT HISTORY AND LITERATURE

A program leading to the degree of Master of Arts may be arranged in the combined fields of Ancient History and the Classical Languages. Such a program must be approved by Mr. McDonald of the Department of History, Mr. Titchener of the Department of Classical Languages, and the Dean of the Graduate School.

ANIMAL SCIENCE

Office, 203 Plumb Hall

PROFESSORS SUTTON, KAUFFMAN, BELL, KUNKLE, AND MOXON, ASSOCIATE PROFESSORS BENTLEY AND WILSON, ASSISTANT PROFESSORS TEAGUE AND TYZNIK

All work leading to a graduate degree in this department shall be done under the supervision of a graduate committee which shall consist of the chairman of the department, a member of the staff chosen by the chairman and the student's adviser. This committee shall pass on a candidate's fitness for the work, prescribe his course, and approve his thesis plans before he proceeds.

The areas of specialization for graduate work in the Department of Animal Science are animal nutrition, animal genetics, animal production and meats.

Basic prerequisites for all undergraduate students in Animal Science shall include acceptable courses in physiology. In addition students interested in animal nutrition should have credit in academic courses in agricultural or biological chemistry equivalent to Agricultural Biochemistry 601; those interested in animal genetics should have credit in academic courses equivalent to Zoology 408.

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

608. Livestock Marketing. Five credit hours. Winter Quarter. Five lectures each week. General prerequisites must include a course in feeding livestock and Rural Economics 618. Mr. Henning.

The various agencies and organizations involved in the marketing of livestock will be studied. Methods of selling, basis of sale, choice of markets, grade price differentials will be reviewed. The problems of transportation and financing will be considered. Emphasis will be placed on recent developments, concentration, direct to packer marketing, costs of marketing, management, public relations and other problems in livestock marketing.

618. Animal Nutrition. Five credit hours. Winter Quarter. Five lecture discussion and demonstration periods each week. General prerequisites must include a minimum of 16 Quarter hours in Chemistry and Agricultural Biochemistry, a minimum of 10 Quarter hours in Animal Science and a minimum of 20 Quarter hours in biological science. Mr. Tyznik.

The principles of nutrition and their application to farm animals.

701. Special Problems. Two to five credit hours. Autumn, Winter, and Spring Quarters. Offered at Columbus and at Wooster. Mr. Kauffman, Mr. Kunkle, Mr. Bell, Mr. Moxon, Mr. Bentley, Mr. Wilson, Mr. Teague, Mr. Tyznik.

Special assignments in the advanced phases of any of the lines of animal production and meats. Students will elect work in desired subjects after conference with the instructor in charge.

NOTE: Students desiring work in animal nutrition, see also Agricultural Biochemistry 601, 607, 609.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

This will include at least two years' study of the types and breeding of live stock with collateral work in the principles of breeding, feeding and management.

810. Animal Science Seminar. One credit hour. Autumn, Winter, and Spring Quarters. Required of all graduate students in Animal Science. Offered at Columbus and at Wooster.

Discussions of current animal science research.

898. Interdepartmental Seminar in Nutrition and Food Technology. One credit hours. Spring Quarter. In cooperation between the Institute of Nutrition and Food Technology and the several departments interested, a seminar will be conducted in nutrition and in the related field of food technology. Subject and staff will be announced each year after approval by the Graduate School.

950. Research in Animal Science. Autumn, Winter, and Spring Quarters. Offered at Columbus and at Wooster.

Research work in Animal Science is conducted under the direction of Mr. Kauffman, Mr. Bell; in Nutrition under the direction of Mr. Sutton, Mr. Moxon; and in Meats under the direction of Mr. Kunkle.

ANTHROPOLOGY

(See Sociology and Anthropology)

ARCHITECTURE AND LANDSCAPE ARCHITECTURE

Office, 106 Brown Hall

PROFESSORS WHITAKER, BAUMER, CHUBB (EMERITUS), OMAN, RONAN, SMITH, SUTTON, AND WILSON, ASSOCIATE PROFESSOR PHILLIAN, ASSISTANT PROFESSORS BORCHERS, CLARK, LINDBERG, TILLEN, AND TOBEY

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

ARCHITECTURE

771-772-773. Special Studies in Architecture. One to five credit hours. Autumn, Winter, and Spring Quarters. Elective for students who have completed their third year in Architecture.

These courses are open by permission of the School to students majoring in Architecture desiring to pursue special studies not offered in the fixed curriculum.

LANDSCAPE ARCHITECTURE

701. Landscape Architecture: Special Problems. Two to ten credit hours. Autumn, Winter, and Spring Quarters. Prerequisite, third or fourth year standing. Staff.

This course is open, by permission of the department, to students in the Graduate School and those who wish to pursue special studies in landscape architecture not offered in the fixed curricula.

ART

(See Fine Arts)

ASTRONOMY

(See Physics and Astronomy)

BACTERIOLOGY

Office, 210 Pharmacy and Bacteriology Building

PROFESSORS BIRKELAND, STAHLY, WEISER, HUDSON, WOOLPERT, STARIN, (EMERITUS), AND MORREY (EMERITUS), ASSOCIATE PROFESSORS DODD, RANGLES, RIDDLE, AND SASLAW, ASSISTANT PROFESSORS BALDWIN, BOHL, AND RHEINS, AND LECTURER BOLE.

Requirements for the Master's Degree: (a) The course requirements for the Master's degree are not rigidly fixed, but in addition to his major work the candidate should take courses in fundamental biology, chemistry (organic and physiological), comparative anatomy, physics and mathematics. The choice and number of allied courses are arranged by conferring with the adviser and depend on the student's field of specialization in bacteriology and on his previous training. (b) A thesis based on independent research is required as a part of the student's scientific training. (c) The candidate must pass a written preliminary examination, dealing with the material of the basic courses in bacteriology and allied sciences, before the end of the second Quarter preceding the Quarter of expected graduation. (d) Final written and oral examinations must be passed at least two weeks before the date of graduation and after the submission and approval of the student's thesis.

Requirements for the Degree Doctor of Philosophy: (a) In order to be considered worthy of undertaking work toward the Doctor's degree, a student must display notable ability in bacteriology and allied sciences, an aptitude in research, and facility in the use of the English language. To demonstrate the student's fitness in these respects, the Department may require an examination. (b) An advisory committee is appointed for each student to aid in arranging his program and in carrying it to completion. The sequence of courses to be taken in the Department and the choice of work in allied fields depend on the student's previous training and objectives. An understanding of the basic techniques and concepts of biology, chemistry, physics, and mathematics is required. Ordinarily not more than one-third of the credit hours toward the degree should originate outside the Department. (c) The student must satisfy the University language requirements for the Doctor's degree as modified by the Department of Bacteriology. These requirements may be fulfilled by (1) a comprehensive examination in German, or (2) a reading knowledge of German and French. With departmental staff approval another modern language may be substituted for French, if it is of major importance in the candidate's field of specialization. The foreign language requirements must be satisfied not later than the Quarter preceding that in which the General Examination is to be taken. (d) The student is required to pass a preliminary oral examination covering the fundamentals of bacteriology and allied sciences not later than the fifth Quarter preceding the Quarter of graduation. The general examination and the final examination are taken in accordance with regulations of the Graduate School. (e) The dissertation, embodying the research of the candidate must represent a contribution to science and be of a publishable grade of excellence. It must be submitted to the advisory committee not less than six weeks prior to the date of graduation. If accepted by the committee, it is transmitted to the Dean of the Graduate School for approval. Two final copies of the dissertation and an abstract must be deposited in the office of the Graduate School and one copy of each with the advisory committee.

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

The prerequisites for all courses in this group consist of ten hours of biological sciences and fifteen hours of chemistry in addition to any other prerequisites stated in the descriptions of the courses.

Students intending to specialize in bacteriology should take in addition to their major work courses in botany, zoology, organic and physiological chemistry, physics, physiology, comparative anatomy, histology, pathology, dairy technology, or agronomy, depending upon the student's field of interest in bacteriology and his previous training.

602. Veterinary Bacteriology. Five credit hours. Winter Quarter. Three class periods and three two-hour laboratory periods each week. General prerequisites must include Bacteriology 607. Mr. Bohl and assistants.

A study of the mechanism of infection and resistance to disease will be followed by a discussion of the pathogenic bacteria important in veterinary medicine. The laboratory exercises emphasize the characteristics of the microorganisms and the techniques useful in isolation and identification of pathogens.

Not open to students who have credit for Bacteriology 502.

Open for graduate credit only to students who are doubly registered in the College of Veterinary Medicine and the Graduate School.

603. Veterinary Bacteriology. Five credit hours. Spring Quarter. Three class periods and three two-hour laboratory periods each week. General prerequisites must include Bacteriology 602. Mr. Bohl and assistants.

A continuation of Bacteriology 602. Discussion and laboratory exercises will deal with viruses and pathogenic fungi. The latter part of the course will be devoted to immunology, serologic diagnosis and biological products.

Not open to students who have credit for Bacteriology 503.

Open for graduate credit only to students who are doubly registered in the College of Veterinary Medicine and the Graduate School.

607. General Bacteriology. Five credit hours. One Quarter. Autumn, Winter, Spring. Three class periods, and three two-hour laboratory periods each week. Mr. Stahly, Mr. Weiser, Mr. Randles, Mr. Baldwin, and assistants.

The lectures consider the morphology, physiology, and classification of bacteria as well as some of their applications to everyday processes. The laboratory work provides experience in preparing media and in staining, observing, culturing, isolating, and identifying microorganisms.

Not open for graduate credit to students majoring in bacteriology.

Not open to students who have credit for Bacteriology 550.

608. Introduction to Pathogenic Bacteriology. Three credit hours. Winter Quarter. Three class periods each week. General prerequisites must include Bacteriology 607. Mr. Birkeland, Mr. Rheins.

A general course designed to acquaint students with those bacteria causing disease in man, their habitats and modes of transmission, and an elementary consideration of the immunological processes involved. Designed primarily for students who desire a general knowledge of the field and not for students majoring in bacteriology.

610. Dairy Bacteriology. Three credit hours. Autumn Quarter. Three class periods each week. General prerequisites must include Bacteriology 607. Mr. Weiser.

Sources and kinds of microorganisms in milk and other dairy products. Microorganisms involved in desirable and undesirable fermentations and methods of control. The importance of sanitation in the production and handling of milk and other dairy products. Emphasis is placed upon milk-borne diseases in relation to public health.

611. Dairy Bacteriology: Laboratory. Three credit hours. Autumn Quarter. Three two-hour laboratory periods each week. Bacteriology 610 must be included in the general prerequisites or be taken concurrently. Mr. Weiser.

A study of standard methods used to control microorganisms discussed in Bacteriology 610. Normal and abnormal fermentations are studied in detail.

619. Pathogenic Protozoology. Three credit hours. Spring Quarter. Three class periods each week. General prerequisites must include Bacteriology 654, or equivalent.

The various pathogenic protozoa of man and domestic game animals are considered, with special attention to amebae and plasmodia of malaria. Emphasis is placed on the principles of parasitism involved and on insect transmission.

622. Principles of Infection and Resistance. Three credit hours. One Quarter. Autumn and Winter. Three class periods each week. General prerequisites must include Bacteriology 607 or equivalent. Mr. Dodd.

A study of host-parasite relationships with emphasis on pathogenicity and immunity.

Not open to students who have credit for Bacteriology 617.

623. Serology. Three credit hours. One Quarter. Winter and Spring. Three three-hour laboratory periods each week. Bacteriology 622 must be included in the general prerequisites or taken concurrently. Mr. Dodd and assistants.

Theories and techniques of antigen-antibody reactions.

Not open to students who have credit for Bacteriology 618.

633. Advanced General Bacteriology. Five credit hours. Autumn Quarter. Three class periods, and three two-hour laboratory periods each week. General prerequisites must include Bacteriology 607. Mr. Baldwin, Mr. Stahly and assistants.

A course concerned with an advanced and detailed study of the basic phenomena of bacterial morphology, composition, growth, cultivation, variation, and classification.

634. Sanitary Bacteriology. Three credit hours. Winter Quarter. Two class periods and two two-hour laboratory periods each week. General prerequisites must include Bacteriology 607. Mr. Weiser, Mr. Malaney, and assistants.

The principles involved in water purification, including swimming pools, and municipal and industrial water supplies. The role of microorganisms in the treatment of sewage and industrial wastes. Emphasis is placed upon the role of sanitation and public health regulations in the control of infectious diseases transmitted through water and sewage.

635. Physiology of Bacteria. Three credit hours. Winter Quarter. Three class periods each week. General prerequisites must include Bacteriology 622, 633, 636 or equivalents and two Quarters of organic chemistry. Mr. Stahly.

Nutritional requirements of bacteria, mechanisms of anaerobic dissimilation of carbon compounds, and industrial fermentations.

636. Food Microbiology. Three credit hours. One Quarter. Autumn and Spring. Three class periods each week. General prerequisites must include Bacteriology 607. Mr. Weiser, Mr. Malaney.

The role of microorganisms in normal and abnormal fermentations (food spoilage) and their control; methods of food preservation. Emphasis is placed upon the role of sanitation and public health regulations in the control of infectious diseases transmitted through food.

637. Food Microbiology: Laboratory. Three credit hours. One Quarter. Autumn and Spring. Three two-hour laboratory periods each week. General prerequisites must include Bacteriology 607; Bacteriology 636 must be included in the prerequisites or taken concurrently. A previous course in Pathogenic Bacteriology is recommended or may be taken concurrently. Mr. Weiser, Mr. Malaney, and assistants.

Laboratory work on organisms discussed in Bacteriology 636.

638. Physiology of Bacteria. Three credit hours. Spring Quarter. Three class periods each week. General prerequisites must include Bacteriology 622 and 623 or equivalents and two Quarters of organic chemistry. Mr. Randles.

Bacterial enzymes, mechanisms and energy relationships in respiration, nitrogen metabolism, and bacterial syntheses.

641. Medical Bacteriology. Five credit hours. Spring Quarter. Three class periods and eight laboratory hours each week. Mr. Riddle, the staff, and assistants.

Morphology and physiology in general. Detailed study of pathogenic bacteria with respect to morphologic, physiologic, and serologic characteristics. The epidemiology and pathogenesis of infectious diseases. Bacteriological methods of diagnosis, prevention, and treatment.

Open for graduate credit only to students who are doubly registered in the College of Medicine and the Graduate School.

642. Medical Bacteriology (Continued). Five credit hours. Autumn Quarter. Two class periods and six laboratory hours each week. Mr. Birkeland, Mr. Dodd, Mr. Saslaw, Mr. Baldwin, Mr. Rheins, and assistants.

A continuation of Bacteriology 641, including a consideration of the pathogenic fungi and the viruses.

Open for graduate credit only to students who are doubly registered in the College of Medicine and the Graduate School.

649. Filterable Viruses. Three credit hours. Winter Quarter. Three class periods each week. General prerequisites must include Bacteriology 622 and 623, and either Bacteriology 654 or 659, or equivalents. Mr. Birkeland.

Lecture and demonstration course on the nature and action of filterable viruses as ultra-microscopic parasites of man, animals and plants.

652. General and Pathogenic Bacteriology for Dental Students. Six credit hours. Winter Quarter. Four class periods and three two-hour laboratory periods each week. Dentistry, second year. Mr. Riddle, Mr. Baldwin, and assistants.

A survey of the techniques and principles of microbiology and immunology followed by an intensive study of the more important pathogenic species and with special reference to the bacteriology of the oral cavity.

Open for graduate credit only to students who are doubly registered in the College of Dentistry and the Graduate School.

654. Pathogenic Bacteriology. Five credit hours. Winter Quarter. Three class periods and three two-hour laboratory periods each week. General prerequisites must include Bacteriology 607 and 622. Mr. Rheins.

A discussion of the pathogenic cocci and enteric bacilli causing diseases of man with emphasis on the properties associated with infection and on physiologic, epidemiologic, and immunologic relationships.

Not open to students who have credit for Bacteriology 655-656.

659. Pathogenic Bacteriology. Five credit hours. One Quarter. Autumn and Spring. Three class periods and three two-hour laboratory periods each week. General prerequisites must include Bacteriology 607 and 622. Mr. Rheins.

A discussion of the mycobacteria, corynebacteria, clostridia, brucella, pasteurilla, spirochetes, and fungi causing diseases of man with emphasis on the properties associated with infection and on physiologic, epidemiologic, and immunologic relationships.

Not open to students who have credit for Bacteriology 657 or 658.

701. Minor Investigations. One to five credit hours each Quarter. Autumn, Winter, Spring. A student may enter at the beginning of any Quarter. General prerequisites must include satisfactory courses in the field of the problem undertaken. Department staff.

This course is designed for such students as have completed the equivalent of two years work in bacteriology and are still undergraduates. The work will be outlined by the instructor in charge to meet the individual student's needs.

710. History of Bacteriology and Allied Fields. Three credit hours. Spring Quarter. Lectures, conferences, and library work. General prerequisites must include advanced graduate standing in bacteriology or permission of the instructor. Mr. Birkeland.

This course is designed for students specializing in bacteriology. Its purpose is to acquaint the student with the historical development of bacteriology, immunology, and allied fields, to introduce him to the principal workers in the various fields, and to show how their contributions are related to our present concepts.

720. Filterable Viruses: Laboratory. Three credit hours. Spring Quarter. Three two-hour laboratory periods each week. General prerequisites must include Bacteriology 623, 654, 659, 649. Mr. Bohl and staff.

Laboratory study of viruses and some of the virus diseases of animals and man. Methods of isolation, propagation, identification, diagnosis and control are considered.

722. Immunology. Three credit hours. Spring Quarter. General prerequisites must include Bacteriology 622, 623, 654, and 659, and suitable courses in biochemistry and physical chemistry. Permission of the instructor. Mr. Dodd.

Advanced studies of immunological phenomena with emphasis on the physical, chemical aspects of antigens and antibodies.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

807-808-809. Seminar in Bacteriology. One credit hour. Autumn, Winter, and Spring Quarters. Required of all graduate students majoring in bacteriology. Department staff.

898. Interdepartmental Seminar in Nutrition and Food Technology. One credit hour. Spring Quarter. In cooperation between the Institute of Nutrition and Food Technology and the several departments interested, a seminar will be conducted in nutrition and in the related field of food technology. Subject and staff will be announced each year after approval by the Graduate School.

950. Research in Bacteriology. Autumn, Winter, and Spring Quarters. General prerequisites must include acceptable courses in the chosen field of research. Department staff.

BOTANY AND PLANT PATHOLOGY

Office, 102 Botany and Zoology Building

PROFESSORS MEYER, TRANSEAU (EMERITUS), STOVER (EMERITUS), SAMPSON, BLAYDES, ALLISON, YOUNG, TAFT, WILSON, ALEXANDER, AND GRAY, ASSOCIATE PROFESSORS WALLER, WOLFE, SWANSON, AND POPHAM, ASSISTANT PROFESSORS LAMPE, JONES, PADDOCK, BOHNING, AND WEISHAUPF

Requirements for Advanced Degrees: In addition to the requirements of the Graduate School, candidates for the Master's degree should have had, prior to taking the comprehensive examination, acceptable courses in general botany, general zoology, local flora, plant physiology, plant anatomy, ecology, plant pathology, and organic or biological or agricultural chemistry. Additional courses required will depend upon the student's field of specialization, and will be decided upon in consultation with the student's adviser.

Candidates for the Doctor's degree, in addition to meeting the language and other requirements of the Graduate School, and the course requirements for the Master's degree, must select, in consultation with their advisers, such additional courses in botany and other science departments as will form a broad foundation for research in plant science.

Students may specialize in certain phases of plant physiology, morphology, pathology, mycology, ecology, genetics and taxonomy.

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

601. Plant Ecology. Five credit hours. Autumn Quarter. Three lectures and one three-hour laboratory period each week. Mr. Wolfe.

Patterns of vegetation, local, regional and continental; historic, climatic, soil, and biotic factors that limit the various plant communities. Lectures, discussions, and laboratory work on tundra, boreal forest, hemlock-hardwood, and deciduous forest. Field study of Ohio plant communities and their successions. Several extended Saturday field trips.

602. Plant Ecology. Five credit hours. Spring Quarter. Three lectures and one three-hour laboratory period each week. General prerequisites must include Botany 601. Mr. Wolfe.

Continuation of Botany 601. The forest, grassland, and desert vegetation of western North America. Lectures, reference reading and laboratory work. Further study of Ohio plant communities. Several extended Saturday field trips.

605. Plant Physiology. Five credit hours. One Quarter. Autumn and Winter. Three lectures and two two-hour laboratory periods each week. Mr. Meyer, Mr. Swanson, Mr. Böhning.

A fundamental course in plant physiology: solutions, colloidal systems, cell physiology, diffusion phenomena, osmotic quantities, permeability, transpiration, absorption and movement of water, photosynthesis.

606. Plant Physiology. Five credit hours. One Quarter. Winter and Spring. Three lectures and two two-hour laboratory periods each week. General prerequisites must include Botany 605. Mr. Meyer, Mr. Swanson, Mr. Bohning.

Continuation of Botany 605: photosynthesis, syntheses of carbohydrates, fats, and nitrogenous compounds, absorption and utilization of mineral salts, digestion, translocation of solutes, respiration, growth, reproduction, dormancy.

***613. Bryophytes, Pteridophytes, and Gymnosperms.** Five credit hours. Winter Quarter. Four two-hour laboratory-discussion periods each week. Given in alternate years. Miss Lampe.

A study of the comparative structures and life histories of the liverworts, mosses, ferns, and conifers. Hereditary variations in form and structure within and among these groups during geologic time; world distribution and habitats of fossil and living genera.

614. Morphology of the Angiosperms. Five credit hours. Autumn Quarter. Four two-hour laboratory-discussion periods each week. Mr. Blaydes.

The basic principles of the reproductive mechanism in angiosperms and their application to problems in genetics, plant breeding, and crop production.

615. Plant Microtechnic. Five credit hours. Winter Quarter. Two lectures and three two-hour laboratory periods each week. Mr. Blaydes, Mr. Popham.

Principles and methods of fixing, imbedding, sectioning and staining of plant tissues for permanent microscopic preparations. Opportunity is given for preparing a collection of microscope slides suitable for use in teaching. Students having research materials may use these in making microscopic preparations.

619. Economic Botany. Five credit hours. Winter Quarter. Five lectures each week. General prerequisites must include elementary courses in botany and biological science or geography. Mr. Waller.

The plant sources of sugars, fats, proteins, fibers, rubber, and wood products. Related problems of production and distribution are illustrated and discussed. Field trips to distributing centers are scheduled when possible.

635. Plant Genetics. Five credit hours. Autumn Quarter. Three recitations and two two-hour laboratory periods each week. General prerequisites must include a course in heredity. Mr. Paddock.

Applications of the principles of genetics to investigations of the anatomy, ecology, evolution, morphology, physiology, and taxonomy of higher plants. Laboratory experience with acetocarmine smears, colchicine, progeny testing, flower emasculation and hybridization.

640. Developmental Plant Anatomy. Five credit hours. Spring Quarter. Four two-hour laboratory-discussion periods each week. General prerequisites must include four Quarters of biological sciences. Mr. Popham.

The initiation, differentiation and development of tissues, tissue systems and organs of vascular plants, and a comparative study of the various structures. This course is a desirable antecedent to advanced work in plant physiology, pathology and morphology.

650. Diseases of Fruit Crops. Three credit hours. Autumn Quarter. Three two-hour laboratory-discussion periods each week. General prerequisites must include a course in plant pathology. Mr. Allison.

A detailed study of important tree and small fruit crop diseases; their cause, distribution, severity, and specific control measures.

Not open to students who have credit for Botany 656A.

651. Diseases of Cereal and Forage Crops. Three credit hours. Winter Quarter. Three two-hour laboratory-discussion periods each week. General prerequisites must include a course in plant pathology. Mr. Allison.

A detailed study of important cereal and forage crop diseases; their cause, distribution, severity, importance, and specific control measures.

Not open to students who have credit for Botany 656C.

* Not given in 1954-1955.

652. Diseases of Vegetable Crops. Three credit hours. Spring Quarter. Three two-hour laboratory-discussion periods each week. General prerequisites must include a course in plant pathology. Mr. Allison.

A detailed study of important vegetable crop diseases; their cause, distribution, severity, importance and specific control measures.

Not open to students who have credit for Botany 656B.

653. Mycology. Five credit hours. Autumn Quarter. Three lectures and two two-hour laboratory periods each week. General prerequisites must include an elementary course in botany and two additional Quarters of biological sciences. Mr. Gray.

A study of the structures, life histories, and classification of the fungi.

***654. Advanced Mycology.** Three credit hours. Spring Quarter. Given in alternate years. Three two-hour laboratory periods each week. General prerequisites must include Botany 653. Mr. Gray.

Advanced detailed study of specific groups of fungi, with emphasis on their morphology, cytology, and genetics.

655. Industrial Mycology. Three credit hours. Spring Quarter. Two discussion hours and one two-hour laboratory period each week. General prerequisites must include Botany 605-606, or two Quarters of organic chemistry. Desirable antecedent, Botany 653. Mr. Gray.

The relation of fungi, especially saprophytic fungi, to human affairs, with emphasis upon their actual and potential applications in industry.

***660. Bacterial Plant Pathogens.** Three credit hours. Autumn Quarter. Two lecture-discussion hours and one two-hour laboratory period each week. General prerequisites must include a course in plant pathology and Bacteriology 607. Given in alternate years. Mr. Allison.

A study of the representative types of bacterial plant diseases and factors affecting their control, severity, distribution, and economic importance. Methods used in studying plant pathogenic bacteria.

665. Algae. Five credit hours. Spring Quarter. Four two-hour laboratory-discussion periods each week. General prerequisites must include an elementary course in botany and zoology and two additional Quarters of biological sciences. Mr. Taft.

A general course covering identification, growth, reproduction, evolution, distribution, and economic importance of the algae.

671. Plant Pathology. Five credit hours. Winter Quarter. Three lectures and two two-hour laboratory periods each week. General prerequisites must include elementary courses in botany, fifteen additional hours of biological science, and permission of the instructor. Mr. Allison.

A course in plant pathology emphasizing general principles of plant disease development and control for students with a considerable background in the biological sciences. A number of representative plant diseases will be studied.

Not open to students who have credit for Botany 710.

Not open for credit to plant pathology majors.

701. Special Problems. Two to five credit hours each Quarter. Autumn, Winter, Spring. Offered at Columbus and Wooster. The staff.

Problems may be selected in the fields of Taxonomy, Morphology, Anatomy, Physiology, Ecology, Genetics, Cytology, Plant Pathology, and Mycology.

710. Principles of Plant Pathology. Three credit hours. Winter Quarter. One lecture or discussion hour and two two-hour laboratory periods each week. General prerequisites must include Botany 650, or 651, or 652. Mr. Allison.

A systematic study of the basic factors governing the development of plant diseases, including host-parasite relationships, effect of environment on disease development, and the nature of disease resistance.

* Not given in 1954-1955.

711. Methods in Plant Pathology. Three credit hours. Autumn Quarter. Six laboratory-discussion hours each week. General prerequisites must include at least one "600" level course in plant pathology or bacteriology. Mr. Alexander.

A laboratory course designed to acquaint students with plant pathological research methods and special techniques involved in microscopic recognition of pathogens in plant tissues, isolation and culture of pathogens, and demonstration of the pathogenicity of the several types of plant pathogens (bacteria, fungi, viruses, nematodes).

718. Physiology of Fungi. Five credit hours. Winter Quarter. Three lectures and two two-hour laboratory periods each week. General prerequisites must include Botany 605-606 and 653. Mr. Gray.

The physiology of the nutrition, growth, and reproduction of fungi.

720. Plant Microchemistry. Five credit hours. Autumn Quarter. One lecture and three two-hour laboratory periods each week. General prerequisites must include Botany 605 and 606. Desirable antecedent, organic chemistry. Mr. Sampson.

The identification of organic and inorganic substances in plant tissues by microchemical methods and polarized light. These methods are of special value in recognizing substances within cells and local regions too small to be separated for test-tube methods of tissue analysis.

Not open to students who have credit for Botany 617.

725. Physiological Methods. Three credit hours. Winter Quarter. Six laboratory hours each week. Botany 605-606 must be included in the general prerequisites or taken concurrently. Mr. Swanson, Mr. Meyer.

A laboratory course in the methods of plant physiology such as measurements of H-ion concentration, osmotic quantities, permeability, enzyme activity, and the processes of transpiration, respiration, and photosynthesis. Conferences, readings, and laboratory work.

Not open to students who have credit for Botany 633.

730. Physiological Methods. Three credit hours. Autumn Quarter. Six laboratory hours each week. Botany 605-606 must be included in the general prerequisites or taken concurrently. Mr. Meyer, Mr. Swanson.

Methods of measuring the physical factors of the environment that influence plant growth and development, under laboratory conditions. Methods of growing plants under controlled conditions for experimental work. Conferences, readings, and laboratory work.

Not open to students who have credit for Botany 632.

735. Plant Growth. Three credit hours. Spring Quarter. Three lectures each week. General prerequisites must include Botany 605-606. Mr. Sampson.

A study of the physiology of growth. Special attention is given to the interrelated effects of internal and external factors upon growth, movement, and reproduction in plants. Bibliographies and reviews of literature.

Not open to students who have credit for Botany 634.

737. Plant Cytology. Three credit hours. Winter Quarter. Three two-hour laboratory periods each week. General prerequisites must include Botany 605-606. Given in alternate years. Miss Lampe.

The colloidal nature and chemistry of cell organs in living and fixed condition. Effect of various chemicals upon protoplasmic structure. Ontogeny, structure, divisions, and fusions of plant cells. Chromosome structure and behavior; chromosome and gene mutations.

***740. Plant Cytogenetics.** Three or five credit hours. Spring Quarter. Given in alternate years. Three lectures and two two-hour laboratory periods each week. General prerequisites must include Zoology 618 or Botany 737, and permission of the instructor. Mr. Paddock.

A study of chromosomal aberrations as to their origin, effects on chromosome morphology and behavior, effects on genetic ratios, transmissibility, and usefulness in practical breeding programs and in attacks on fundamental problems of cytogenetics.

750. Ecological Methods. Three credit hours. Spring Quarter. Given in

* Not given in 1954-1955.

alternate years. Two lecture-discussion hours and one two-hour laboratory period each week. Five full Saturdays of field work. General prerequisites must include Botany 601 or equivalent. Mr. Wolfe.

Field practice in measuring edaphic and climatic factors in plant habitats; analysis of the data; methods of mapping vegetation; statistical analysis of vegetation; sources of climatic data; paleoecological techniques.

755. Principles of Plant Taxonomy. Five credit hours. Autumn Quarter. Four two-hour laboratory-discussion periods each week. General prerequisites must include a course in local flora and Botany 614. Desirable antecedent, Botany 613. Given in alternate years. Miss Lampe.

A study of the evolutionary development of characters in the pteridophytes, gymnosperms and especially the angiosperms, together with a comparative study of the taxonomic systems which cover these groups. Emphasis is placed upon the basic philosophy underlying each system and the taxonomic principles involved.

Not open to students who have credit for Botany 645 and 646.

760. History of Botany. Three credit hours. Autumn Quarter. General prerequisites must include two courses in general botany and two additional Quarters of biological science. Mr. Waller.

A brief survey of the fundamental discoveries that have led to modern concepts in plant science.

NOTE: TEACHING COURSES. For the Teaching Course in this department see the Department of Education, Course 683.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

810. Botanical Colloquium. One credit hour. Autumn, Winter, and Spring Quarters. Required of all graduate students majoring in botany. Offered at Columbus and at Wooster. Mr. Meyer and staff.

815. Seminar in Plant Pathology. Two credit hours. Autumn, Winter, and Spring Quarters. Required of all graduate students majoring in plant pathology. This course may be repeated. Mr. Allison.

820. Seminar in Plant Physiology. One credit hour. This course may be repeated. Autumn, Winter, and Spring Quarters. Required of all graduate students majoring in plant physiology. Elective for other qualified students. Mr. Meyer, Mr. Swanson, Mr. Böhning.

825. Seminar in Plant Ecology. Two credit hours. Autumn and Winter Quarters. General prerequisites must include Botany 601. Required of all graduate students majoring in plant ecology. This course may be repeated. Mr. Wolfe.

898. Interdepartmental Seminar in Nutrition and Food Technology. One credit hour. Spring Quarter. In cooperation between the Institute of Nutrition and Food Technology and the several departments interested, a seminar will be conducted in nutrition and in the related field of food technology. Subject and staff will be announced each year after approval by the Graduate School.

950. Research in Botany. Autumn, Winter, and Spring Quarters. Offered at Columbus and at Wooster.

Research work in taxonomy, morphology, anatomy, algology, cytology, physiology, genetics, ecology, mycology, plant pathology, or economic botany is offered by various members of the staff. Mr. Meyer, Mr. Stover, Mr. Sampson, Mr. Waller, Mr. Blaydes, Mr. Allison, Miss Lampe, Mr. Taft, Mr. Wolfe, Mr. Swanson, Mr. Popham, Mr. Gray, Mr. Jones, Mr. Paddock, Mr. Transeau, Mr. Rife, Mr. Young, Mr. Wilson, Mr. Alexander, Mr. Böhning, Miss Weishaupt.

BUREAU OF BUSINESS RESEARCH

Office, 206 Hagerty Hall

PROFESSOR BOOTHE, ASSOCIATE PROFESSORS YOCUM AND ARNOLD,
ASSISTANT PROFESSORS CONDOIDE, AND BAKER

The purposes of the Bureau of Business Research are to facilitate the research activities of the faculty and the graduate students of the College of Commerce and Administration and at the same time to make cooperative studies in business and industry which will be valuable in the commercial and industrial development of the state. Through its research activities and its monthly publications, *The Bulletin of Business Research* and *The Ohio Retail Annalist*, the Bureau maintains continuous contacts with representatives of trade and industry in the state, as well as with research and administrative departments of the Federal, State, and local governments.

For many years the Bureau of Business Research has served as the central coordinating agency for research in problems of business operation and of basic economic trends in the state. The Bureau sponsors periodically a state and regional Conference of Statisticians on Business Research and assists in all the college conferences in cooperation with the various departments of the College.

The Bureau maintains physical equipment such as adding and calculating machines, tabulating machines, typewriters, duplicating equipment, etc., as well as a technical and clerical staff. These facilities, in so far as possible, are available to members of the instructional staffs of the various departments of the College of Commerce, to graduate students where researches of a quantitative nature can be undertaken only with the cooperation of a research organization, and for demonstration of machine procedures and techniques to undergraduate classes. There is also maintained a specialized research library in the field of business and industrial statistics. Researches which meet the standards of the Bureau are published as books, monographs, or special studies of the Bureau and given widespread circulation by the Bureau.

BUREAU OF EDUCATIONAL RESEARCH

Office, 203, 204 Arps Hall

PROFESSORS FOSHAY (DIRECTOR), DALE, ECKELBERRY, W. FLESHER, HERRICK, HOLY (DIRECTOR EMERITUS), MOONEY, K. TYLER, AND WOELFEL, ASSOCIATE PROFESSORS MacLATCHY, AND SESSIONS, ASSISTANT PROFESSORS CONRAD, M. FLESHER, AND WILLIAMS, MISS GIBBONY, MR. KILBOURN, MR. NIEDERHAUSER, MISS SEEGER, MRS. M. TYLER, AND MISS VESEY

The major purpose of the Bureau of Educational Research, which was organized in 1921, is to promote the scientific investigation of educational problems in the College, in the University, and in the public schools of the State. An important step to facilitate the Bureau's work was taken when the Board of Trustees, on October 11, 1942, authorized the President of the University to assign staff members from other departments in the University to the Bureau for full-time or part-time services to carry on approved investigations.

Service: In addition to its research and field service functions, the Bureau maintains a number of service agencies and activities of value to students: Teacher Placement Office, Reference Library, and Educational and Psychological Test File, Teaching Aids Laboratory, and Curriculum Materials Center.

Library: The Reference Library contains large quantities of material in the form of manuscripts, pamphlets, bulletins, reports, and educational periodicals. The services of the reference librarian in charge are available to graduate students. She will assist in the preparation of bibliographies and advise on any phase of library research. Included in this Library is the Educational and Psychological Test File.

Research Problem: According to the nature and character of the problem and the scholastic status of the student, he may work with members of the Bureau in either of two groups of courses:

MINOR PROBLEMS. One to four credit hours. Investigation of minor problems

Education 600

Psychology 650

INDIVIDUAL PROBLEMS. Two to fifteen credit hours. Investigation of problems leading to preparation of theses for advance degrees.

Education 950

Psychology 950

Courses: In order to make the resources of the Bureau serve their research purposes, students desiring to work in the Bureau may register in certain courses listed in the Departments of Education and Psychology. Such students will be under the direction and supervision of Bureau Staff members. Courses given by members of the Bureau Staff are as follows:

Education

600 Minor Problems

(D) Guidance. Mr. Mooney

(F) History of Education and Comparative Education. Mr. Eckelberry

(J) Radio and Television. Mr. Tyler.

(K) Secondary Education. Mr. Eckelberry

(M) Educational Administration. Mr. Flesher, Mr. Herrick, Mr. Sessions.

(S) Audio-Visual Materials of Instruction. Mr. Dale, Miss Williams, Mr. Woelfel

(V) Research Techniques. Mr. Dale, Mr. Flesher, Mr. Mooney, Mr. Woelfel

601 Radio and Television in Education. Mr. Tyler.

602 Audio-Visual Materials of Instruction. Mr. Dale, Mr. Woelfel

800 Seminar in Education

(J) Radio and Television. Autumn, Winter, and Spring Quarters. Mr. Tyler.

(S) Audio-Visual Materials of Instruction. Autumn, Winter, and Spring Quarters. Mr. Dale, Mr. Woelfel

(V) Research Techniques. Autumn, Winter, and Spring Quarters. Bureau of Educational Research Staff

835 Advanced Studies in Education

(D) Guidance. Mr. Mooney

(F) History of Education and Comparative Education. Mr. Eckelberry

(J) Radio and Television. Mr. Tyler.

(M) Educational Administration. Mr. Flesher, Mr. Herrick, Mr. Sessions

(S) Audio-Visual Materials of Instruction. Mr. Dale, Mr. Woelfel

(V) Research Techniques. Mr. Flesher, Mr. Mooney, Mr. Woelfel

880 School Plant Planning, Winter Quarter. Mr. Herrick

950 Research in Education

(D) Guidance. Mr. Mooney

(F) History of Education and Comparative Education. Mr. Eckelberry

(J) Radio and Television in Education. Mr. Tyler.

(K) Secondary Education. Mr. Eckelberry

(M) Educational Administration. Mr. Flesher, Mr. Herrick, Mr. Sessions

(S) Audio-Visual Materials of Instruction. Mr. Dale, Mr. Woelfel

(V) Research Techniques. Mr. Dale, Mr. Flesher, Mr. Mooney, Mr. Woelfel

Psychology

650 Minor Problems

950 Research in Psychology

NOTE: Descriptions of above courses and prerequisites will be found under department announcements.

BUREAU OF SPECIAL AND ADULT EDUCATION

Office, 321 Arps Hall

PROFESSORS NISONGER, SANDERSON, AND HENDRICKSON, **ASSOCIATE PROFESSORS** ROSEBROOK AND CASSIDY, **ASSISTANT PROFESSORS** PHELPS AND HART

The functions of the Bureau of Special and Adult Education are: (1) to facilitate the education of all types of Exceptional Children, (2) to encourage the development of Child Study Services in the Schools, and (3) to further the work of adult education.

SPECIAL EDUCATION

Teacher Education: Opportunities for professional training in Special Education are available to qualified graduate students interested in the problems of exceptional children. Opportunities are available for students to become familiar with identification, diagnosis, treatment, counseling, education, placement, and with the educational needs of all types of exceptional children such as the mentally handicapped, crippled, defective in speech, vision and hearing, children with behavior problems, lowered vitality, convulsive disorders, and the gifted. Students will also be given opportunities for concentrated study in one or more of these areas or in child study, in remedial procedures for the educationally retarded, and in the administration and supervision of special education programs.

Opportunities are available for supervised field and intern experiences in schools and in public and private institutions in areas of Special Education.

Field Service: In cooperation with the Division of Special Education of the State Department of Education, the State Departments of Health and Welfare, and state and local organizations, the Bureau of Special and Adult Education provides consultant services to assist schools and institutions as follows:

1. In organizing and developing child study programs.
2. In exploring state and local resources for diagnosis, treatment, and training of exceptional children.
3. In surveying needs for Special Education.
4. In establishing new programs for different types of exceptional children.
5. In developing in-service training programs for teachers.
6. In interpreting the needs of exceptional children to parents.

SUGGESTED CURRICULA

For graduate work, it is possible to work out majors and minors in the following areas: basic area for exceptional children; mentally retarded; educationally retarded; behavior problems; and children with defective speech and hearing. Courses starred are required of all graduate students working in this area.

Basic Courses For Exceptional Children

Psychology 605	Physiological Psychology
Psychology 608	Educational Statistics: Elementary
*Psychology 609	Exceptional Children: General Survey
Psychology 610	Adolescence
Psychology 611	Intellectual Deviate
*Psychology 613	Mental and Educational Tests
*Psychology 615	Psycho-Educational Diagnosis and Treatment
Psychology 622	Delinquent Children
Psychology 628	Principles and Economy of Learning
Psychology 681	Nature and Appraisal of Individual Differences
Psychology 640	Educational and Vocational Guidance
Psychology 668	Psychology of Childhood
Psychology 671	Principles of Treating the Problem Child
Psychology 680	Educational Tests and Measurements
*Psychology 683	Psychology of Reading
Psychology 695	Clinical Psychology
Psychology 713	Laboratory in Psychological and Educational Measurement
Psychology 718	The Psychology of Group Psychotherapy
Psychology 861	Clinical Psychology
Psychology 862	Psychopathology
Psychology 863	Psychodynamics
*Education 667	Methods of Dealing with Exceptional Children in Schools
Education 676	Teaching in the Core Program in the Secondary School
Education 704	Laboratory Study of the Ohio State University School
Education 750	Fundamentals of Guidance
Education 764	Supervised Teaching in Special Classes
*Education 772	Preparation of Handicapped Children for Post-School Adjustment
*Education 800-T	Seminar in Special Education
*Education 820	The Education of Exceptional Children

GRADUATE SCHOOL

Sociology 605
Sociology 676
Sociology 680

American Minority Groups
Social Classes
Social Orientation of Children

Behavior Problems

Psychology 622
Psychology 634
Psychology 671
Psychology 718

Delinquent Children
Criminal and Legal Psychology
Principles of Treating the Problem Child
Psychology of Group Psycho-therapy

Education 766

Principles and Methods of Teaching Behavior Problem Children
Juvenile Delinquency and Its Treatment

Social Administration 627

Mentally Retarded Children

Psychology 611
Psychology 615
Education 666
Education 764
Education 773

Intellectual Deviate
Psycho-Educational Diagnosis and Treatment
Introduction to the Education of the Mentally Retarded
Supervised Teaching in Special Classes
Practicum in Program Planning for Slow Learning Children

Educationally Retarded Children

Psychology 615
Psychology 683
Education 654
Education 656
Education 661

Psycho-Educational Diagnosis and Treatment
Psychology of Reading
Mathematics in Elementary Education
Language and Reading in the Elementary School
Guidance Problems in the Elementary School

Children with Defective Speech and Hearing

Speech 677

Anatomy, Physiology, and Pathology of the Ear and Vocal Mechanisms

Speech 678

Hearing and Speech

Speech 682

Hearing Conservation and Pathology

Speech 683

Lip Reading

Speech 684

Lip Reading Clinic

Speech 688

Audiometry: Principles and Practices

Speech 694

Speech Disorders Survey

Speech 695

Speech Pathology I

Speech 696

Speech Pathology II

Speech 697

Clinical Principles in Speech Correction

Speech 698

Clinical Practice in Speech Correction

Education 668

Methods and Techniques in Speech and Hearing Therapy

RESEARCH COURSES

Students interested in research and applied problems connected with the education of exceptional children may register in any of the following courses with the permission of the instructor:

Psychology 650
Psychology 950
Education 600-T
Education 950-T
Speech 700
Speech 950

Minor Problems
Research in Psychology
Minor Problems
Research in Education
Minor Problems in Speech
Research in Speech

ADULT EDUCATION

Teacher Education. By combining specific courses in the field of adult education from related fields the Bureau offers a graduate program of training for those intending to teach adults or to administer adult education programs. Workers with adults in group work agencies, public schools, colleges and universities, churches, labor organizations and in rural agencies may, upon approval, enroll for one or more courses or may take a full program leading to the M.A. or Ph.D. degree with a major or minor in adult education.

Field Service. The aims of field service are as follows: to aid in the organization of adult study groups; to assist organized groups in formulating programs of study; to prepare and issue courses of study, bulletins and other materials for the use of adult groups; and to cooperate with state and local organizations in furthering the work of adult education.

University Courses. Students interested in taking work in adult education may enroll in any of the following courses:

Education 600-B	Minor Problems
Education 770	Adult Education
Education 771	Parent Education
Education 774	Discussion Methods in Adult Education
Education 800-B	Seminar in Adult Education
Education 898	Planning Community Adult Education Programs
Education 950-B	Research in Education
Psychology 670	Psychological Problems of Adult Life
Social Administration 830	Community Organization Processes

NOTE: Description of the courses listed above and their time schedules will be found under the department announcements.

BUSINESS ORGANIZATION

Offices, 352, 354 Hagerty Hall

PROFESSORS MAYNARD, WEIDLER, HOAGLAND, DICE (EMERITUS), VAN CLEEF, DUFFUS, BECKMAN, R. C. DAVIS, REEDER, SMART, DEWEY, DONALDSON, JUCIUS, LEY, AND DAMERON, ASSOCIATE PROFESSORS CORDELL (EMERITUS), BARTELS, BICKLEY, J. H. DAVIS, RIDDLE, BROWN, CRAIG, TUTTLE, HEALEY AND HICKS, ASSISTANT PROFESSORS ALLEN, QUANTIUS, MINER, STEELE, BALLE, CULLMAN, DAVIDSON, HOWELL AND PFAHL, MR. BONNER, MR. MARLOWE, MR. VELMAN, MR. JENKINS, MR. NUDD, MR. SCOTT, MR. SHAW, MR. STOCKTON, LECTURERS AND ASSISTANTS

Prerequisites for Graduate Work: The Department of Business Organization offers majors leading to the degrees Master of Business Administration or Master of Arts and Doctor of Philosophy. In each case, the program is based on the assumption that the candidate will have adequate undergraduate training in economics and business organization subjects. Specifically, each candidate must present undergraduate work as indicated below or pursue courses in this University of equivalent nature. Such courses will be taken in addition to the Graduate School requirements of forty-five hours of graduate work for the degree in question.

For requirements for the degrees Master of Business Administration and Doctor of Philosophy, see pages 45 to 49 of this bulletin.

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

613. Statistical Methods Applied to Business. Three credit hours. Spring Quarter. Wright Field Graduate Center only. General prerequisites must include a course in elementary economic statistics or its equivalent as determined by the instructor. Mr. Tuttle.

The theory and practice of preparing and using business index numbers. The analysis of elementary economic time series. Students will be expected to work out complete statistical problems and reports involving the use of modern statistical computing and tabulating equipment.

Not open to students who have credit for Business Organization 614.

614. Business Statistics. Four credit hours. Winter Quarter. Three class meetings and one two-hour laboratory period each week. General prerequisites must include courses in economic statistics. Mr. Tuttle.

Price and production indexes. Analysis of time series. Linear correlation applied to economic and business problems. The application of tabulating and other mechanical equipment to statistical problems will receive some attention.

Not open to students who have credit for Business Organization 613.

615. Industrial Statistics. Three credit hours. Spring Quarter. General prerequisites must include courses in economic statistics. Mr. Smart.

The application of statistical methods to the design and analysis of experiments with a view to planning, organizing and controlling the output of industry.

621. Business Law: Contracts. Three credit hours. One Quarter. Autumn, Winter, Spring. Mr. Ley, Mr. Craig, Mr. Marlowe, Mr. Howell, Mr. Velman.

A course in the law of contracts for the student of business, including the study of the fundamentals of legally binding agreements between persons, and their enforcement.

Not available for graduate credit for students majoring in Business Organization or Accounting.

622. Business Law for Engineers and Architects. Three credit hours. One Quarter. Autumn, Winter, Spring. Mr. Marlowe.

A course in the law of contracts with special reference to engineering and architectural problems and with incidental reference to certain other phases of the law that most closely affect the engineer and architect.

623. Business Law: Agency, Sales, Property. Three credit hours. One Quarter. Autumn, Winter, Spring. General prerequisites must include Business Organization 621. Mr. Marlowe, Mr. Howell, Mr. Velman.

A study of selected, fundamental principles in the subjects named, deemed important to the student of business.

Not available for graduate credit for students majoring in Business Organization or Accounting.

625. Business Law: Negotiable Instruments. Three credit hours. One Quarter. Autumn, Winter, Spring. General prerequisites must include Business Organization 621. Mr. Craig, Mr. Howell.

A course in the laws governing bills of exchange, promissory notes and checks designed to guide the business man in his daily transactions with such instruments.

627. Business Law: Partnerships and Corporations. Three credit hours. One Quarter. Autumn, Winter, Spring. General prerequisites must include Business Organization 621. Mr. Craig.

A course designed to give the student of business a practical working knowledge of important laws governing the formation and operation of partnerships and corporations.

633. Governmental Agencies and Business. Three credit hours. Winter Quarter. Three meetings each week. Mr. Ley, Mr. Dewey.

A study of the various administrative agencies created by the local, state, and federal governments for the regulation of business from the viewpoint of the student of business. Particular consideration is given to the organization, jurisdiction and procedure of such administrative agencies and their relations to business.

635. Business Policy. Three credit hours. One Quarter. Autumn, Winter, Spring. Five class meetings each week. General prerequisites must include a course in intermediate accounting, a course in money and banking, a course in elementary economic statistics, Business Organization 650, 680, and 700, and in addition the approval of a departmental committee which supervises this course.

The approach of this course is that of the chief administrative officers of a business enterprise. The course deals with such topics as the functions of administration; the contributions of accounting, finance, production, management, marketing, statistics, etc., to the solution of managerial problems; the evaluation and control of business risks; the establishment and supervision of departmental plans; and the development of public relations.

640. Corporate Organization and Control. Three credit hours. One Quarter. Autumn, Winter, Spring. Three class meetings each week. Mr. Donaldson

Types of business enterprise; the corporation; rights, duties, obligations, and liabilities of stockholders, directors, and officers.

642. Real Estate Principles. Three credit hours. One Quarter. Autumn, Winter, Spring. Three class meetings each week. Mr. Hoagland, Mr. Bonner.

Principles of real property ownership and real estate practice; types of deeds, leases, restrictions; real estate brokerage, selling, advertising; property management; subdividing and developing; zoning and its effects.

643. Real Estate Finance. Three credit hours. Autumn Quarter. Three class meetings each week. General prerequisites must include Business Organization 642. Mr. Hoagland, Mr. Bonner.

Methods of financing real estate of various kinds and interests therein; sources of funds; loan contracts; methods of repayment; analysis of mortgage risks; the role of governmental agencies in the financing of real estate.

644. Real Estate Problems. One to three credit hours. One Quarter. Autumn, Winter, Spring. Permission of instructor must be obtained. Mr. Hoagland.

Individual research in the field of real estate, designed for students primarily interested in real estate investments and in possibilities of the real estate business.

645. Trade Associations. Three credit hours. Spring Quarter. Three class meetings each week.

The nature and function of trade associations, and their relation to business and to government.

646. Real Estate Appraisals. Three credit hours. Winter Quarter. General prerequisites must include Business Organization 642. Mr. Hoagland.

Economic theories of value applied to real estate; appraisal as a guide to business decisions; market forces which affect value; appraisal methods; selection and analysis of data; special problems in appraising different kinds of real estate interests.

647. Real Estate Development and Management. Three credit hours. Spring Quarter. General prerequisites must include Business Organization 642. Mr. Hoagland, Mr. Bonner.

Selection and utilization of sites for residential, commercial, and industrial purposes; property management policies and practices, including rent schedules, maintenance, tenant relationships, modernization, and problems of unprofitable real estate; economic and social significance of housing problems; proposed remedies, including governmental participation.

650. Corporation Finance. Five credit hours. One Quarter. Autumn, Winter, Spring. Five class meetings each week. Mr. Hoagland, Mr. Duffus, Mr. Riddle, Mr. Pfahl.

Financial structure and problems of modern business corporations.

Not open to students who have credit for Economics 616.

652. Problems in Business Finance. Three credit hours. One Quarter. Autumn and Spring. Three class meetings each week. General prerequisites must include Business Organization 650. Mr. Donaldson.

A study of specific cases which involve the financial policies and operations of industrial companies. Intended to improve the students ability to utilize the principles and methods of financial analysis acquired in introductory courses.

653. Industrial Consolidations and Mergers. Three credit hours. Autumn Quarter. Three class meetings each week. General prerequisites must include Business Organization 640 or 650 or Economics 616. Mr. Hoagland.

Historical and analytical study of industrial consolidations and mergers.

655. Principles of Investment. Three credit hours. One Quarter. Autumn and Spring. Three class meetings each week. General prerequisites must include Economics 616 or Business Organization 650. Mr. Donaldson, Mr. Riddle.

Functions of investment; economic basis of investment; basic elements of investment; investment programs; problems of personal finance; field of investment. All these topics are considered from the point of view of the investor.

656. Transportation and Public Utility Finance. Three credit hours. Winter Quarter. Three class meetings each week. General prerequisites must include Business Organization 650. Mr. Riddle, Mr. Duffus.

Financial problems peculiar to public service industries; American railroads, public utilities, motor bus and motor freight companies, airlines, and other inland transportation agencies as opportunities for investment and speculation; their financial management under state and federal regulation.

657. Investment Analysis. Three credit hours. Winter Quarter. Three class meetings each week. General prerequisites must include Business Organization 650. Mr. Riddle.

Principles and procedure of investment analysis; principles and technique of selecting corporation and government bonds, real estate obligations, and common stocks; the interpretation of financial factors; investments and business conditions; practical applications.

659. Investment Houses and Financial Markets. Three credit hours. Spring Quarter. Three class meetings each week. General prerequisites must include Business Organization 650. Mr. Riddle.

The capital needs of business; outlets for investment funds; the problem of financing business; structure and operation of the investment banking system in its relations to the security markets; investment policies of institutional investors; regulation of investment banking and the capital market.

660. The Stock Market. Three credit hours. One Quarter. Autumn and Spring. Three class meetings each week. General prerequisites must include Business Organization 650 and a course in money and banking. Mr. Donaldson.

The New York Stock Exchange; brokerage houses, methods of trading; business cycles and movements of stock prices; regulation of stock issue and manipulation.

662. The Money Market. Three credit hours. Spring Quarter. General prerequisites must include a course in money and banking. Mr. Balles.

The functioning of the short-term open money markets; the commercial paper market, the acceptance market, the government security market, and the federal funds market. The practical technique through which the Federal Reserve credit control policy is brought to bear on the economic system.

665. Foreign Exchange. Three credit hours. Winter Quarter. Three class meetings each week. General prerequisites must include a course in money and banking. Mr. Quantius.

A study of the theory and practices of foreign exchange from the standpoint of both bankers and foreign traders. The relationship of foreign exchange to international trade and financial problems is included.

670. Bank Organization and Management. Three credit hours. Autumn Quarter. General prerequisites must include a course in money and banking and Business Organization 650..

This course deals with the organization and practical operation of banks; their relations to the Federal Reserve System; government control; trends and required reforms.

672. Corporation Finance. Three credit hours. One Quarter. One meeting of three class hours each week. Wright Field Graduate Center only. General prerequisites must include an elementary course in economics and accounting.

The place of the corporation in our economy. Types of securities used by business corporations. Methods of obtaining capital. Marketing of securities. Regulation of issuance of securities.

Not available for graduate credit for students majoring in Business Organization.

Not open to students who have credit for Business Organization 650.

673. Corporation Finance. Three credit hours. One Quarter. One meeting of three class hours each week. Wright Field Graduate Center only. General prerequisites must include Business Organization 672.

Problems of internal financial control. Determination of profits and their distribution. Corporate expansion and public attitudes concerning forms thereof. Capital readjustments of solvent and insolvent corporations. Social control of corporation finance.

Not available for graduate credit for students majoring in Business Organization.

Not open to students who have credit for Business Organization 650.

***674. Savings and Trust Institutions.** Three credit hours. Winter Quarter. Three class meetings each week. Given in alternate years. General prerequisites must include a course in money and banking. Mr. Hoagland.

The practical operations and economic significance of the building and loan associations, savings banks, trust companies, and various other institutions are studied.

676. Industrial Organization and Management. Three credit hours. One

* Not given in 1954-1955.

Quarter. One meeting of three class hours each week. Wright Field Graduate Center only. General prerequisites must include an elementary course in economics and accounting.

An intensive examination of the basic fundamentals of organization and management underlying the solution of managerial problems. While specifically directed towards the production organization, consideration will be given to other types of business and associations.

Not available for graduate credit for students majoring in Business Organization.

Not open to students who have credit for Business Organization 680.

677. Industrial Organization and Management. Three credit hours. One Quarter. One meeting of three class hours each week. Wright Field Graduate Center only. General prerequisites must include Business Organization 676.

The application of the basic fundamentals of organization and management to specific areas of activity including locational problems, physical facilities analysis, production and quality control, and the procurement and utilization of materials and personnel.

Not available for graduate credit for students majoring in Business Organization.

Not open to students who have credit for Business Organization 680.

680. Industrial Organization and Management. Five credit hours. One Quarter. Autumn, Winter, Spring. Five class meetings each week. Mr. R. C. Davis, Mr. Healey.

An examination of the basic fundamentals of management underlying the solution of problems of organization and operation in all business enterprise, followed by their application to such specific fields of industrial management as production, materials, personnel, etc.

682. Supervisory Management. Three credit hours. Winter Quarter. General prerequisites must include Business Organization 680. Mr. Jucius, Mr. R. C. Davis.

The work of operative management within the modern factory, with particular reference to the responsibilities of the shop department head. A consideration of various phases of industrial management from his viewpoint. A critical examination of his problems, such as the intra-departmental control of production progress, maintenance of quality, training of employees, handling of grievances, correct disciplinary procedures, morale maintenance, and others, in the light of accepted management principles.

685. Purchasing, Stores, and Inventory Control. Three credit hours. One Quarter. Autumn and Spring. Three class meetings each week. General prerequisites must include Business Organization 680. Mr. R. C. Davis, Mr. Healey.

An examination of the objectives, principles, and methods that enter into the work of managing the functions of supply in industry. Considers various problems including those relating to the planning of materials requirements, purchasing, receiving, storing and disbursing.

686. Personnel Organization and Management. Four credit hours. One Quarter. Autumn and Winter. Four class meetings each week. General prerequisites must include Business Organization 680. Mr. Jucius, Mr. R. C. Davis.

An examination of the staff work required in planning, organizing, and controlling the personnel functions in the business organization, as well as the personnel responsibilities of the line executive. Presents basic principles and procedures relating to employment, industrial health and safety, labor relations and morale, employee education and training, and wage and salary administration.

Not open to students who have credit for Business Organization 689.

687. Production Organization and Management. Four credit hours. One Quarter. Autumn and Winter. Four class meetings each week. General prerequisites must include Business Organization 680. Mr. R. C. Davis, Mr. Healey, Mr. Rahdert.

An examination of the staff functions of production control and its relations with the line organization of the manufacturing division; the coordination of production with sales and finance; the coordination of various technical staff services with the requirements of the line function of production; routine planning, scheduling, and other control functions as they enter into inter-departmental coordination within the line organization; case problems illustrating the application of control principles.

688. Work Standards and Labor Compensation. Three credit hours. Spring Quarter. Three class meetings each week. General prerequisites must include Business Organization 680. Mr. R. C. Davis.

A critical examination of policy, functionalization, organization morale, business procedure, standardization, and other fundamental concepts in business organization and operation, as they enter into the practical determination of good working conditions, a fair day's work, and good wages.

689. Retail Personnel Organization and Management. Three credit hours. Winter Quarter. General prerequisites must include Business Organization 680 and 700. Mrs. Allen, Mr. Jucius.

This course examines the personnel management problems of executives in modern retail business. It considers management's responsibilities for an effective and proper use of its human resources, and the methods that it uses in analyzing its personnel problems, as well as the techniques employed in selecting, training, transferring, promoting, and dismissing members of the organization, controlling wage and salary adjustments, handling grievances, and performing other personnel duties.

Not open to students who have credit for Business Organization 686.

690. Personnel Management for Engineers. Four credit hours. Spring Quarter. Four class meetings each week. Required in the Curriculum in Industrial Engineering. General prerequisites must include Industrial Engineering 602. Mr. Healey.

Principles and practices of personnel management employed at supervisory and executive levels. Staff relationships of engineering personnel to personnel departments. Such topics as the following shall be considered: Selection, training, transfers and promotions, wage administration, morale maintenance, grievances and disciplinary practices, labor legislations, and informal employer-employee relationships.

Not open to students in the College of Commerce and Administration.

691. Office Organization and Management. Three credit hours. One Quarter. Winter and Spring. Three class meetings each week. General prerequisites must include Business Organization 680. Mr. R. C. Davis, Mr. Hicks.

The planning, organizing, and controlling of office work. Problems of office standards, business forms and their design, the selection of business machines, the analysis of office methods.

692. Problems in Personnel Organization and Management. Three credit hours. Spring Quarter. Three class meetings each week. General prerequisites must include Business Organization 686 or 689. Mr. Jucius, Mr. Healey.

This course is concerned with solving actual problems and examining case histories with a view to developing the student's proficiency in applying principles to and in handling technical tools in connection with such personnel problems as employment, industrial health and safety, labor relations and morals, employee education and training, wage and salary administration, and relations with governmental agencies.

693. Wage and Salary Administration. Three credit hours. Winter Quarter. Three class meetings each week. General prerequisites must include Business Organization 686 or Business Organization 689. Mr. Jucius, Mr. R. C. Davis.

This course is designed to examine managerial problems of determining equitable operative and executive compensation plans, based upon information supplied by various staff specialists. It encompasses study of alternative methods of compensation, wage and salary differentials and classifications, and administrative control of compensation procedures within individual companies.

700. Marketing. Five credit hours. One Quarter. Autumn, Winter, Spring. Five class meetings each week. Mr. Beckman, Mr. Bartels, Mr. Brown, Mr. Miner.

A general but critical survey of the field of marketing. Consumer demand in relation to the marketing machinery. Functions, methods, policies, marketing costs, and problems of the farmer, manufacturer, wholesaler, commission merchant, broker, retailer and other middlemen. Emphasis on principles, trends, and policies in relation to marketing efficiency.

703. Business Research. Three credit hours. Autumn Quarter. Two lectures and one two-hour laboratory period each week. General prerequisites must include Business Organization 650, 680, and 700, a course in elementary economic statistics, and permission of the instructor. Mr. Miner.

Business research treated from the viewpoint of the business executive. The course deals with the discovery and utilization of existing information relating to problems of analysis other than accounting. It also includes a study of the fundamentals of primary data research, sampling, and schedule construction. Principles and practice of effective research writings are stressed throughout.

704. Marketing Research. Three credit hours. Winter Quarter. Two lectures and one two-hour laboratory period each week. General prerequisites must include a course in elementary economic statistics and Business Organization 700. Mr. Miner.

Nature, scope, functions, and organization of marketing research. Sources and types of available data useful in the solution of marketing problems. Procedures and methods of the field investigation including a study of sampling fundamentals, schedule construction, data collection, tabulation and analysis, and interpretation and presentation of research findings.

705. Retailing. Four credit hours. One Quarter. Autumn, Winter, Spring. Four class meetings each week. General prerequisites must include Business Organization 700 and elementary courses in accounting. Mr. Brown, Mr. Davidson.

A consideration of the organization and management of retail establishments: store location; store organization; buying; receiving; stockkeeping; inventories; sales systems; store policies; services; expenses and profits; deliveries; personnel problems, etc.

706. Wholesaling. Four credit hours. One Quarter. Autumn, Winter, Spring. Four class meetings each week. General prerequisites must include Business Organization 700 and elementary courses in accounting. Mr. Beckman, Mr. Davidson.

The field of wholesaling; types and classes of wholesale organizations; tendencies in wholesaling; wholesale centers. Organization and management of wholesale establishments including location, purchasing, receiving, stock control, advertising, selling, order filling, traffic management, credit granting, expenses, profits, etc.

707. Retail Merchandising and Control. Three credit hours. Winter Quarter. Three class meetings each week. General prerequisites must include Business Organization 705, elementary courses in accounting, and a course in elementary economic statistics. Mr. Brown, Mr. Davidson.

A course designed principally for students who are interested in a retail merchandising career. Cases, problems, and readings. Emphasis upon planning and analysis with reference to merchandise and expense budgets, pricing, purchase planning, buying technique, stock control, and related phases of operation in retailing institutions.

708. Problems in Marketing Research. Three credit hours. Spring Quarter. Two lectures and one two-hour laboratory period each week. General prerequisites must include Business Organization 704 and 614. Mr. Miner.

A course designed for students who have a professional interest in marketing research and desire work in areas such as advanced sampling and communication techniques, research as an aid to sales management, and advertising and media research. Electrical tabulating equipment of the Bureau of Business Research is available as needed.

709. Credits and Collections. Four credit hours. One Quarter. Autumn, Winter, Spring. Four class meetings each week. General prerequisites must include Business Organization 700 and elementary courses in accounting. Mr. Beckman, Mr. Bartels, Mr. Miner.

Credit—nature, functions, instruments, classes, risk, organization and management. Sources of credit information. Collection methods and policies. Extensions, compositions, adjustments, receiverships, bankruptcy, credit insurance, credit limits, credit and collection control.

710. Advanced Credits and Collections. Three credit hours. Spring Quarter. Three class meetings each week. General prerequisites must include Business Organization 709. Mr. Beckman.

A course designed for students interested in mercantile or consumer credit and in credit management as a career. Cases, problems, and readings. Emphasis on analysis and interpretation of facts bearing on a given situation and the development of capacity for credit management through the case method of approach.

712. Sales Management. Four credit hours. One Quarter. Autumn,

Winter, Spring. Four class meetings each week. General prerequisites must include Business Organization 700. Mr. Maynard, Mr. J. H. Davis, Mr. Cullman.

This course deals with the functions of the sales manager. Principal topics considered are: Sales organization; planning, quotas and territories; selecting, training, and compensating salesmen; stimulation and supervision; and the use of cost data as a guide to the formulation of sales policies.

713. Salesmanship. Two credit hours. One Quarter. Autumn and Spring. General prerequisites must include Business Organization 700. Mr. Maynard, Mr. Brown.

Effective selling technique. The psychological, economic, and marketing foundations of the sales activities which are the basis of the daily work of the salesman. The material considered is designed to be of value to students throughout the University as well as those majoring in marketing or commercial education.

Not available for graduate credit for students majoring in Business Organization.

716. Principles of Advertising. Four credit hours. One Quarter. Autumn, Winter, Spring. Four class meetings each week. General prerequisites must include Business Organization 700. Mr. Dameron, Mr. Cullman, Mr. Bartels.

A general course in advertising which considers the use of advertising and sales promotion in the sale of goods and services. Advertising agencies. Advertising departments. Copy, layout, illustrations, typography, engraving. Advertising media including newspapers, radio, television, magazines, outdoor, direct mail, and others. Advertising research. National advertising campaigns. Economics of advertising.

717. Advertising Practice. Three credit hours. One Quarter. Autumn and Winter. Two class meetings and one two-hour laboratory period each week. General prerequisites must include Business Organization 716. Mr. Dameron.

The technique of advertising with emphasis on copy and layout. Consumer and trade advertising in general markets. Advertising production. Advertising technique in relation to selling problems. Preparation of radio advertising programs and technique of commercial announcements. Preparation of copy for a television program. Copy and layout for advertisements, magazines, newspapers, direct mail, and so forth.

Laboratory assignments based upon practical advertising problems.

718. Radio and Television Advertising. Three credit hours. Winter Quarter. Three class meetings each week. Prerequisite, Business Organization 716. Mr. Dameron, Mr. Cullman.

Radio advertising from the viewpoints of the advertiser and of stations and networks selling radio time. History. Organization. Radio advertising problems: choosing the station, time and methods of broadcasting, programs, writing commercials, merchandising the campaign, research. Radio advertising by retailers. Sales promotion by networks and stations. Regulation of radio advertising. Television advertising. Consumer viewpoints.

719. Retail Advertising and Sales Promotion. Four credit hours. One Quarter. Winter and Spring. Two class meetings and one two-hour laboratory period each week. General prerequisites must include Business Organization 717 or permission of the instructor. Mr. Dameron, Mrs. Allen.

Advertising department of a retail store. Importance of newspaper advertising to retailer. Use of radio and television advertising by retailer. Window displays. Inside the store promotions. Direct mail. Sales promotion. Advertising and sales promotion budgets. Advertising plans. Coordination of selling effort.

Laboratory problems based upon actual store promotions.

720-721. Exporting and Importing. Three credit hours. Two Quarters. 720, Autumn; 721, Winter. Three class meetings each week. General prerequisites must include Business Organization 665 and 716. Mr. Van Cleef.

Methods of conducting export and import business; foreign trade correspondence and advertising; market analysis; sales agencies and sales helps; handling shipments; credits and collections. Documentation. Government aids.

723. Marketing. Three credit hours. One Quarter. Wright Field Graduate Center only. One meeting of three class hours each week. General prerequisites must include an elementary course in economics.

A general but critical survey of the field of marketing relating to its nature and scope, consumer demand and problems, channels of distribution, the retailing and wholesaling systems for consumer and industrial goods. Emphasis on principles and policies. Cases and problems.

Not available for graduate credit for students majoring in Business Organization.

Not open to students who have credit for Business Organization 700.

724. Marketing. Three credit hours. One Quarter. Wright Field Graduate Center only. One meeting of three class hours each week. General prerequisites must include Business Organization 723.

An analytical consideration of marketing functions to discover how each aids in the distribution of goods. A description and evaluation of principal marketing policies. A critical study of marketing costs and of the function of government in market controls. Cases and problems.

Not available for graduate credit for students majoring in Business Organization.

Not open to students who have credit for Business Organization 700.

751. Motor Carrier Organization and Management. Three credit hours. Spring Quarter. Three class meetings each week. General prerequisites must include Economics 618 or 648 or Business Organization 680. Mr. Duffus.

Highway transportation of persons and property by motor vehicles as a business enterprise; organization and administration of the different types and classifications of motor carriers; current problems confronting their management in their relations with travelers, shippers, competing transportation agencies, and administrative law.

752. Industrial and Commercial Traffic Management. Five credit hours. One Quarter. Winter and Spring. Five class meetings each week. General prerequisites must include Economics 618 or 648 or Business Organization 680. Mr. Duffus.

Traffic management as a function in business enterprise. Analysis of the business relationships between shippers and carriers with respect to rates and services in the transportation of goods by rail, highway, water, pipe line, and air. Organization of traffic management by shippers and carriers.

755. Air Transport Management. Three credit hours. Autumn Quarter. Three class meetings each week. General prerequisites must include Economics 619.

Major problems of business management in this industry. Types of airports and problems of their operation. Functions and management of the operating, traffic, personnel, sales, advertising, and other functional departments of an airline. Rate making, insurance practice, labor, and public relations.

760. Life Insurance. Three credit hours. One Quarter. Autumn and Winter. Three class meetings each week. Mr. Bowers, Mr. Bickley.

An examination of the role of life insurance in personal financial planning. Principal topics considered are: the insurance mechanism, types of insurance and annuity contracts, insurance law and contract provisions, industrial and group life insurance, choice of carriers, underwriting problems, and simple programming of life insurance with emphasis upon the buyer's needs.

761. Casualty Insurance and Surety Bonding. Three credit hours. One Quarter. Autumn, Winter, Spring. Three class meetings each week. Mr. Ley, Mr. Bickley.

A study of the following contracts: workmen's compensation; employers', general, and automobile liability; automobile collision; power plant; theft; credit; fidelity; surety bonding; and accident and health. Techniques of loss prevention are considered. A survey of the regulation of carriers and inter-carrier cooperation; state insurance; self-insurance, and reinsurance; and rate-making and reserves.

764. Fire and Marine Insurance. Three credit hours. One Quarter. Autumn, Winter, Spring. Three class meetings each week. Mr. Ley, Mr. Bickley.

An analysis of fire and ocean and inland marine insurance contracts and their adaption to business situations. Attention is given to tests for the selection of insurance carriers, methods of loss adjustment, organization of insurance carriers, and problems of agency management.

765. Advanced Life Insurance. Three credit hours. Winter Quarter. Three

class meetings each week. Proposed as an addition to the sequence in insurance in the Curriculum in General Business. General prerequisites must include Business Organization 760. Mr. Bickley.

A critical analysis of the problems of professional life underwriting. Attention will be given to the role of life insurance in personal estate planning, business insurance, and employee retirement programs. Discussion of problems in probability, rate-making, reserve calculations, and agency management.

786. Personnel Organization and Management. Three credit hours. Wright Field Graduate Center only. Three class hours each week. General prerequisites must include Business Organization 680. Mr. Jucius.

This course is designed to examine managerial functions of planning, organizing, and controlling the procurement, development, utilization, and maintenance of an effective working force. The personnel work of line executives as well as staff specialists is examined, attention is directed to areas of civilian staffs in military installations as well as industrial, commercial, and distributive situations.

787. Production Organization and Control. Three credit hours. Wright Field Graduate Center only. Three class hours each week. General prerequisites must include Business Organization 680. Mr. R. C. Davis.

This course deals with the problem of coordinating line and staff activities in a manufacturing establishment, with particular reference to the execution of production programs or orders. It examines the staff functions of production control; the coordination of product and process planning with the line functions of production; the coordination of various services of technical facilitation with production requirements; the differences in executive leadership requirements between various echelons of the production; the administrative coordination of sales, production and finance and similar problems. Control procedure for such functions as scheduling, machine loading, dispatching and progress control under various types and conditions of manufacturing production, are discussed.

799. Special Problems in Business Organization. One to three credit hours. Autumn, Winter, and Spring Quarters. Permission of the instructor is required.

Individual investigations of specific problems in the following fields of Business Organization:

- a. Corporation Organization and Finance. Mr. Hoagland and others.
- b. Real Estate Problems. Mr. Hoagland and others.
- c. Insurance. Mr. Bowers, Mr. Ley, Mr. Bickley.
- d. Marketing. Mr. Maynard and others.
- e. Banking. Mr. Balles.
- f. Industrial Management. Mr. R. C. Davis and others.
- g. Transportation and Public Utilities. Mr. Duffus.
- h. Radio Advertising. Mr. Dameron, Mr. Cullman.
- i. Personnel Management. Mr. Jucius, Mr. R. C. Davis.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

804. Corporation Finance for Graduate Students. Three credit hours. One Quarter. Winter and Spring. Mr. Hoagland, Mr. Donaldson, Mr. Riddle.

A conference course for graduate students. The content for any particular Quarter will be adapted to the needs of the students enrolled for that Quarter and will be announced in advance.

815-816. Advanced Principles of Marketing. Three credit hours each Quarter. Autumn and Winter. General prerequisites must include Business Organization 700. Mr. Beckman.

A critical study of fundamental principles of marketing. Special emphasis on the historical and theoretical aspects of the subject.

817. Marketing Problems of Contemporary Importance. Three credit hours. Spring Quarter. General prerequisites must include Business Organization 700. This course may be repeated. Mr. Beckman, Mr. Maynard.

A consideration of selected marketing problems, the choice being dependent upon their contemporary significance and the special needs of the students enrolled in the course. As part of the work in this course, each student is assigned a subject for research, analysis, and presentation before the class. At least one written report must be submitted by the student.

818. Seminar in Marketing. One to three credit hours. Autumn, Winter, and Spring Quarters. General prerequisites must include Business Organization 700. This course may be repeated.

Regular class meetings and group discussions of the subject matter embodied by one of the following areas in the field of marketing:

- (a) Advertising. Mr. Dameron.
- (b) Credits and Collections. Mr. Beckman, Mr. Bartels.
- (c) Marketing Research. Mr. Miner.
- (d) Retailing. Mr. Maynard, Mr. Brown.
- (e) Sales Management. Mr. Maynard, Mr. J. H. Davis.
- (f) Wholesaling. Mr. Beckman.
- (g) Market Theory. Mr. Bartels.

819. History of Marketing and Early Marketing Literature. Three credit hours. Autumn Quarter. General prerequisites must include Business Organization 700 and permission of the instructor. Mr. Maynard.

Evolution of marketing institutions, policies, and thought. Critical study and evaluation of early literature in the field, with reference to the business conditions prevailing at the time.

***820. Problems of Banking and of Stock Prices.** One to three credit hours. Spring Quarter.

A seminar in the leading problems relating to banking and to stock prices. The desires of the group will determine whether the major part of the course shall be devoted to problems of banking or to problems involved in determining the movements of stock prices.

***827. The Security Market.** Three credit hours. Autumn Quarter.

A critical study of the markets for listed and unlisted securities and of the factors influencing security prices.

***829. Seminar in Personal Insurance.** Three credit hours. Spring Quarter. Given in alternate years. Mr. Bickley.

A critical consideration of currently important topics in the field of Personal Insurance through class discussion and individual reports on assigned research projects.

830. Seminar in Property Insurance. Three credit hours. Spring Quarter. Given in alternate years. Mr. Bickley.

A critical consideration of currently important topics in the field of Property Insurance through class discussion and individual reports on assigned research projects.

833. The Theory of Organization and Operation. Three credit hours. Autumn Quarter. General prerequisites must include Business Organization 680. Mr. R. C. Davis, Mr. Jucius.

An examination of the following factors as they enter into the problems of planning, organizing and controlling business activities: Business objectives, business ideals, executive leadership, business plans and planning, business policy, functions and functionalization, physical factors of environment. The point of view is that of the administrative executive.

834. The Theory of Organization and Operation. Three credit hours. Winter Quarter. General prerequisites must include Business Organization 680. Mr. R. C. Davis, Mr. Jucius.

An examination of the following factors as they enter into the problem of planning, organizing and controlling business activities: Responsibility, authority, accountability, organization structure, line organization, staff organization, completely functionalized relationships, committee organization, organization specifications. The point of view is that of the administrative executive.

835. Advanced Industrial Management. Three credit hours. Spring Quarter. General prerequisites must include Business Organization 680. Mr. R. C. Davis, Mr. Jucius.

A critical survey and examination of the current trends and advanced problems in the organization and management of industrial enterprises.

836. Advanced Office Organization and Management. Three credit hours. Spring Quarter. General prerequisites must include Business Organization 691. Mr. R. C. Davis, Mr. Hicks.

A critical survey and examination of current trends and advanced problems in the field of Office Organization and Management.

* Not given in 1954-1955.

838. Advanced Personnel Management. Three credit hours. Autumn Quarter. Three hours of class meeting each week. General prerequisites must include Business Organization 686. Mr. Jucius.

A critical survey and examination of current trends and advanced problems in the organization and operation of personnel management.

***845. Advanced Transportation and Public Utilities.** Three credit hours. Spring Quarter. General prerequisites must include Economics 618 or Economics 648 and the permission of the instructor. Mr. Duffus.

An analysis of the leading problems arising from the private ownership and operation of transportation and public utility enterprises. Emphasis is on the functions of the administrative executive.

899. Interdepartmental Seminar. One to five credit hours. All Quarters. When two or more departments desire to establish an interdepartmental seminar on a subject of common interest, the chairman or authorized representatives of the departments concerned shall prepare a course description including the names of faculty members designated to conduct the seminar. The statement shall be submitted to the Executive Committee of the Graduate School for prior approval.

950. Research in Business Organization. Autumn, Winter, and Spring Quarters.

Individual investigations, group discussions participated in by those investigating related subjects. The following fields are suggested:

- (a) Corporation Organization and Finance. Mr. Hoagland, Mr. Duffus, Mr. Donaldson, Mr. Riddle.
- (b) Real Estate Problems. Mr. Hoagland.
- (c) Insurance. Mr. Bowers, Mr. Ley, Mr. Bickley.
- (d) Marketing. Mr. Maynard, Mr. Beckman, Mr. Dameron, Mr. Cordell, Mr. Bartels.
- (e) Banking
- (f) Industrial Management. Mr. R. C. Davis, Mr. Jucius, Mr. Healey.
- (g) Transportation and Public Utilities. Mr. Duffus.
- (h) Personnel Management. Mr. Jucius.

CARTOGRAPHY

(See Geodesy, Geography)

CERAMIC ENGINEERING

Office, 126 Lord Hall

PROFESSORS CARRUTHERS, WATTS (EMERITUS), BOLE (RESEARCH), KING, BLAU, AND RUSSELL

Fields of Study: These may be classified broadly as ceramic and glass engineering and ceramic and glass technology. Graduate study and research under these classifications may be pursued in the following subdivisions: abrasives, electrical ceramics, vitreous enamels, glass, structural clay products, refractories, whiteware (wall tile, sanitary ware, dinnerware, etc.), and technical design of ceramic equipment.

Prerequisites for Graduate Work: Students having a degree in ceramic engineering or technology from an accredited department and who meet the minimum point average of the Graduate School may be admitted without condition to graduate study in the Department of Ceramic Engineering.

Students from non-recognized departments and students with degrees in other scientific fields are required to have training in qualitative and quantitative chemical analysis, physical chemistry, thermochemical mineralogy, mathematics through calculus, and at least one year of physics with laboratory.

Candidates for degrees must either take without credit or pass an examination on the subject matter, Ceramic Engineering 616, Chemistry 680, and one of the following courses most suitable to the selected field of concentration: Ceramic Engineering 605, 610, 625, and 714. Ceramic Engineering 620 and Mineralogy 605 must be taken without credit.

Minimum Requirements for Master of Science Degree: Candidates are required to take 25-35 hours of course work, 10-17 of which shall be selected from Departmental offerings. An acceptable thesis will be required.

At least five Quarters of study and research are usually required of candidates for the Master's degree who do not have a degree from a recognized ceramic engineering department.

* Not given in 1954-1955.

Minimum Requirements for Ph.D. Degree: Candidates are required to take 55-75 hours of course work (20-30 hours from Departmental offerings) including those applied toward the Master's degree. An acceptable dissertation is required.

Special Provisions: Graduate students in this Department may not receive graduate credit for any "600" course in ceramic engineering or glass technology or for Mineralogy 605.

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

603. Elements of Ceramic Engineering. Five credit hours. Spring Quarter. Five lectures each week. General prerequisites must include Chemistry 680 or 681. Mr. Carruthers.

A study of the basic processes and equipment used in the ceramic industries, including grinding, separation, filtration, mixing, forming, and materials handling.

605. Whitewares and Glazes. Four credit hours. Spring Quarter. Four lectures each week. General prerequisites must include Ceramic Engineering 615 and Mineralogy 605. Mr. Russell.

A study of whiteware technology and manufacture including raw materials, body compositions and properties, manufacture of same glazes and colors.

610. Refractories and Their Uses. Five credit hours. Spring Quarter. Five lectures each week. Mr. King.

Lectures on refractories, their physical and chemical compositions and properties, their utilization and testing.

615. Ceramic Calculations. Five credit hours. Autumn Quarter. Five recitations each week. General prerequisites must include courses in quantitative analysis. Mr. King.

Solution of chemical and physical problems involved in compounding ceramic mixtures, including wet blending. Also instruction in development of series, containing one, two, and three variables.

620. Physical and Chemical Measurements of Clays and Other Ceramic Materials. Five credit hours. Winter Quarter. Two recitations and eight laboratory hours each week. General prerequisites must include Ceramic Engineering 615 and Chemistry 680 or 682. Mr. King.

Application of physical chemical laws to ceramic materials and compounds. Laboratory practice in determination of the essential physical and chemical properties of ceramic mixtures and compounds in the plastic, dry, vitrified, and fused states.

625. General Glass Technology. Four credit hours. Autumn Quarter. Two lectures and six laboratory hours each week. General prerequisites must include Chemistry 680 or Chemistry 681 taken concurrently. Mr. Blau.

An introduction to commercial glasses from the viewpoints of their physical and chemical fundamentals. Starting with simple soda-lime glasses, the roles of the constituents are illustrated experimentally and considered in relation to: (a) The formation of glasses; (b) The physical properties of glasses; (c) Modern theories of the structure of glasses.

701. General Ceramic Technology. Four credit hours. Spring Quarter. Conference, library, and laboratory work. General prerequisites must include Mineralogy 605, Ceramic Engineering 615, 620, and Ceramic Engineering 605 taken concurrently. Mr. Russell.

Detailed studies with definite problems in applying ceramic technology to general ceramic processes.

702. Whitewares Technology. Four credit hours. Autumn Quarter. Conference, library, and laboratory work. General prerequisites must include Mineralogy 605, Ceramic Engineering 605, 615, and 620. Mr. Russell.

Detailed studies with definite problems in applying ceramic technology to whitewares.

703. Glaze and Color Technology. Four credit hours. Winter Quarter. Conference, library, and laboratory work. Optional with Ceramic Engineering 709. General prerequisites must include Mineralogy 605, Ceramic Engineering 605, 615, and 620. Mr. Russell.

Detailed studies with definite problems in applying ceramic technology to glazes and colors.

705. Ceramic Equipment Design. Four credit hours. Autumn Quarter. One lecture, one quiz, and six laboratory hours each week. General prerequisites must include Ceramic Engineering 603 and Mechanics 602. Mr. Carruthers.

Designing of clay plant structures and equipment such as buildings, bins, and retaining walls. Practical problems in structural design and storage of clays.

706. Ceramic Equipment Design. Four credit hours. Winter Quarter. One lecture, one quiz, and six laboratory hours each week. General prerequisites must include Ceramic Engineering 705. Mr. Carruthers.

A continuation of Ceramic Engineering 705. Study of drying and fan problems and the design of driers.

707. Ceramic Equipment Design. Four credit hours. Spring Quarter. One lecture, one quiz, and six laboratory hours each week. General prerequisites must include Ceramic Engineering 706. Mr. Carruthers.

A continuation of Ceramic Engineering 706. Study of firing and factory equipment problems and design of kilns and complete clay plants.

709. Refractories Technology. Four credit hours. Spring Quarter. Conference, library and laboratory work. Optional with Ceramic Engineering 703. General prerequisites must include Mineralogy 605, Ceramic Engineering 610 and 620. Mr. King.

Detailed studies with definite problems in applying ceramic technology to the field of refractories.

712. Driers and Theory of Drying. Five credit hours. Autumn Quarter. General prerequisites must include Ceramic Engineering 603 and 620. Mr. Carruthers.

A study of the fundamental physical laws, ceramic technology, drier systems, and control equipment used in drying ceramic materials and wares.

Not open to students having credit for Ceramic Engineering 600.

713. Kilns and Theory of Firing. Five credit hours. Winter Quarter. Five lectures. General prerequisites must include Metallurgy 650 and 651, Mineralogy 605, and Ceramic Engineering 712. Mr. Carruthers.

A study of the fundamental ceramic technology and equipment used in firing ceramic wares and their commercial application.

Not open to students having credit for Ceramic Engineering 601.

714. Vitreous Enamels Technology. Four credit hours. Autumn Quarter. Two class hours and six laboratory hours each week. General prerequisites must include Ceramic Engineering 615 and 620 and Mineralogy 605. Mr. King.

The composition and properties of vitreous enamels, and their application to metals.

Not open to students who have credit for Ceramic Engineering 627.

723. Advanced Glass Technology. Five credit hours. Winter Quarter. Two lectures and six laboratory hours each week. General prerequisites must include Ceramic Engineering 625, Chemistry 683 and 690. Mr. Blau.

Continuation of Ceramic Engineering 625 with particular emphasis on the coordination of composition and physical treatment for obtaining desired properties. This will include the detailed discussion and study of special types of glasses.

Not open to students who have credit for Ceramic Engineering 626.

726. Glass Mixing, Melting and Furnaces. Three credit hours. Winter Quarter. Three lectures each week. General prerequisites must include Ceramic Engineering 625. Mr. Blau.

The practical processes and equipment for producing commercial molten glasses, including the selection and handling of materials, charging, processes in the furnace, types of furnaces, furnace design and operation.

727. Glass Manufacturing Processes. Four credit hours. Spring Quarter. Four lectures each week. General prerequisites must include Ceramic Engineering 723. Mr. Blau.

The industrial processes employed in the manufacture of various types of glass products.

with special emphasis on the relations of physical properties to processes and products. This includes the study of hand production methods, the development of various machine processes employed in the manufacture of containers, bulbs, tubes, flat glass, wire glass, etc., as well as the annealing heat treating and decoration of glass ware.

728. Physical Vitreology. Five credit hours. Autumn Quarter. Three lectures and four laboratory hours each week. General prerequisites must include Ceramic Engineering 723. Mr. Blau.

The theoretical coordination of the previous courses in glass technology through the review of the fundamental concepts and relations of the glassy state, including such viewpoints as random space net-works, bond energy relations, thermal history influences, X-ray diffraction studies, and phase equilibrium diagram relations to the glassy phase.

729. Glass Manufacturing Problems. Five credit hours. Spring Quarter. Three lectures and four laboratory hours each week. General prerequisites must include Ceramic Engineering 723 and 728. Mr. Blau.

The practical coordination of the preceding courses in glass technology through the study of glass plant problems, including the investigation and analysis of defects of commercial glassware, methods for minimizing defects and their relation to production control and product performance.

750. Special Problems. One to seven credit hours. Summer, Autumn, Winter, and Spring Quarters. Conference, library, and laboratory work. General prerequisites must include fundamental ceramic engineering courses. Consent of department is required. This course may be repeated for different problems or continuation of original problem, with total credit not to exceed fifteen hours. All instructors.

This course is designed to permit any properly qualified student to avail himself of the library and laboratory facilities of the department for carrying on a special investigation or for adding to his knowledge and technique in some ceramic subject.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

815. Seminar in Ceramic Engineering. One to five credit hours. Autumn, Winter, and Spring Quarters. Mr. Bole, Mr. Carruthers, Mr. King, Mr. Russell, Mr. Blau.

The course consists of conference and reports on problems in ceramic technology and engineering. Topics are chosen to cover the development of the ceramic industry.

820. Advanced Ceramic Physics and Chemistry. Four credit hours. Autumn Quarter. Four class hours each week. General prerequisites must include basic courses in ceramics and physical chemistry and permission of the instructor. Mr. King.

The fundamentals of crystal chemistry and their applications to ceramics; the surface chemistry of ceramic materials; the colloidal chemistry of clays.

This course or 825 is designed to prepare students for research and should be taken before or concurrent with beginning of work in Ceramic Engineering 950.

821. Advanced Ceramic Physics and Chemistry. Four credit hours. Winter Quarter. Four class hours each week. General prerequisites must include basic courses in ceramics and physical chemistry and permission of the instructor. Mr. King.

Reactions between solid phases, including sintering; the applications of phase equilibria to ceramic problems.

822. Advanced Ceramic Physics and Chemistry. Four credit hours. Spring Quarter. Four class hours each week. General prerequisites must include basic courses in ceramics and physical chemistry and permission of the instructor. Mr. King.

The glass bond; special properties of crystals, organic chemistry; ultrasonics; thermodynamics applied to ceramics; interferometry.

825. Electrical and Technical Ceramics. Four credit hours. Autumn

Quarter. Four lectures and conferences each week. General prerequisites must include Ceramic Engineering 605 and Mineralogy 605. Mr. Russell.

A study of the fundamental nature of porcelain and other special ceramic compositions for various technical applications, with particular emphasis upon electrical and thermal behavior. types of porcelain, the oxide porcelains, titania and titanate dielectrics, ferrites, thermistors, ceramics, and special refractory ceramics are considered.

This course or 820 is designed to prepare students for research and should be taken before or concurrent with beginning of work in Ceramic Engineering 950.

950. Research in Ceramic Engineering. Autumn, Winter, and Spring Quarters. Permission of the instructor must be obtained.

Research in ceramic technology and engineering, in analytical and physical chemistry of ceramic materials and mixtures, in mineralogy and geology of ceramic deposits, in physical and chemical testing of ceramic materials and products, under Mr. Bole, Mr. King, or Mr. Russell; in the engineering, designing and testing of ceramic apparatus, processes, and structures, under Mr. Carruthers; in whitewares, glazes, and technical ceramics, under Mr. Russell; in refractories and metal enamels under Mr. King. Research in glass technology and engineering under Mr. Blau.

CHEMICAL ENGINEERING

Offices, 179, 180 McPherson Chemical Laboratory

PROFESSORS KOFFOLT, HERNDON, AND KAY, ASSOCIATE PROFESSORS GEANKOPLIS, LAPPLE, AND SYVERSON, RESEARCH ASSOCIATE PROFESSORS KERR AND KRUMIN, ASSISTANT PROFESSOR E. E. SMITH, RESEARCH ASSISTANT PROFESSOR SHEETS, MR. REBERT, MR. SERFASS

Prerequisites for Graduate Work: The student must have had undergraduate training in chemical engineering in an accredited school.

Areas of Specialization: Graduate work in the department is designed with the idea of preparing the student for work in the field of chemical engineering, in related fields of industrial chemistry and applied electrochemistry, each of these two latter fields having a quite different undergraduate and graduate approach requiring flexibility in background and foundation. The regular chemical engineering approach is more rigorous and can be arranged by electives and petitions to include the other fields and thus meet the highly diversified opportunities of industry without requiring curricula in preparation for chemical and related industry. It is expected that those with the strictly chemical background will prepare for work in industrial chemistry, but the curriculum may be arranged to take some of the chemical engineering work. It is expected that all graduate students will have had or will take certain of the basic courses in the department. The 600 courses are not available for graduate credit for students majoring in chemical engineering.

Departmental Examinations: Not later than the middle of the Quarter before a student expects to become a candidate for the Master's degree or the Quarter before he expects to take the general examination for the Doctor's degree, he must pass a series of written examinations covering the fundamental work in chemistry, industrial chemistry, and chemical engineering.

The general comprehensive examination for the Master's degree is both oral and written, but the latter part may be waived by the Departmental Committee on Graduate Work if the final writeup of the thesis has met all written criticism in an adequate manner.

Departmental Committee on Graduate Work: A committee, including the Chairman of the Department, acts in an advisory capacity for graduate students and is in charge of the administration of the regulations of the Department.

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

680-681. Fundamentals of Chemical Engineering. Three credit hours. Winter and Spring Quarters. Three lectures and recitations per week. General prerequisites must include one year of general chemistry, differential and integral calculus and one year of college physics except with special permission of the instructor. Mr. Lapple, Mr. Koffolt, Mr. Kay, Mr. Syverson, Mr. Geankoplis, Mr. Rebert.

A survey of the chemical engineering operations as distillation, drying, evaporation, absorption, adsorption, heat transfer, classification, etc. Fundamental chemical engineering process calculations pertaining to heat and energy balances, gas-vapor mixtures, etc.

Not open for students majoring in chemical engineering.

Elective for students in the Colleges of Engineering, Agriculture, Arts, Education, and the Graduate School.

691. Elements of Chemical Engineering. Three credit hours. Winter Quarter. Two lecture-recitation periods and one two-hour computational laboratory each week. General prerequisites must include differential and integral calculus and one year of college physics, except with special permission of the instructor. Mr. Lapple, Mr. Syverson, and assistants.

The beginning of a thorough discussion of the engineering operations utilized in the chemical branch of engineering with emphasis on the engineering requirements of the market and economics and of the process and their effects on the engineering used. The work of this course is concerned with graphical chemical engineering methods, and the study of the behaviour of liquids and gases statically, during compression, and in flow. It is directed toward a study of the fundamental principles involved, the engineering equipment available, and by means of numerous computational problems, the quantitative relationships most frequently encountered in chemical industry.

Not available for graduate credit for students majoring in Chemical Engineering.

692. Elements of Chemical Engineering. Three credit hours. One Quarter. Autumn and Spring. Two lecture-recitation periods and one two-hour computational laboratory each week. Differential and integral calculus and one year of college physics must be included in the general prerequisites or taken concurrently, except with special permission of the instructor. Mr. Geankoplis, Mr. Syverson, Mr. E. E. Smith.

A continuation of the study of the chemical engineering operations. The work of this course covers the applications of the basic principles of heat transfer to equipment design and operation problems of chemical industry. It is integrated with fluid flow work of Chemical Engineering 691. Emphasis is laid on computational problem work.

Not available for graduate credit for students majoring in Chemical Engineering.

693. Problems in Chemical Engineering Operations. Two to eight credit hours. One Quarter. Autumn, Winter, Spring. Conference, library, and laboratory work. Chemical Engineering 691 and 692 must be included in the general prerequisites or taken concurrently. This course may be repeated for credit. Mr. Koffolt, Mr. Rebert.

This course consists of individual or group conferences, library, and laboratory work dealing with the fundamental chemical engineering operations. The work of the course stresses quantitative treatment of the application of physics, mathematics, and chemistry in the field of Chemical Engineering.

Not available for graduate credit for students majoring in Chemical Engineering.

***703. Inspection Trip to the East.** Two credit hours. One week between the Winter and Spring Quarters in even-numbered years. In addition to the general prerequisites, permission of the instructor is required. Mr. Koffolt.

The trip includes Akron and Cleveland, Ohio; Rochester and New York, New York; Grasselli and Deep Water Point, New Jersey; Wilmington, Delaware; Baltimore and Curtis Bay, Maryland; and Washington, D. C. The entire expense need not exceed \$90.00. A satisfactory written report upon the work of the trip is required.

704. Inspection Trip to the West. Two credit hours. One week between the Winter and Spring Quarters in odd-numbered years. In addition to the general prerequisites, permission of the instructor is required. Mr. Koffolt.

The trip includes Dayton, Hamilton, Cincinnati, and Ivorydale, Ohio; Kensington, Illinois; Grasselli and Whiting, Indiana; Chicago and Argo, Illinois; Detroit and Wyandotte, Michigan. The entire expense need not exceed \$70.00. A satisfactory written report upon the work of the trip is required.

708. Practical Experience in Chemical Engineering Work. Six credit hours. General prerequisites must include Chemical Engineering 770. Mr. Koffolt.

* Not given in 1954-1955.

Academic credit for this course is based on the reports of a student who has had practical experience of a chemical engineering character in a semi-responsible position covering a more advanced grade of work than that required in Chemical Engineering 501.

The student shall present a satisfactory report, the outline and basis of which, it is preferred, shall be arranged in conference prior to beginning the work. In general the report shall cover in very considerable detail, the particular industry with which the student is connected, in respect to market demand and economics, chemistry involved, engineering operations, plant layout, special equipment and design, operation methods, costs and efficiencies (in so far as this information is obtainable), labor problems, and safety and health hazards, together with other pertinent matter. Flow sheets, production schedules, sketches and photographs to illustrate the report, are especially to be desired.

The student also who has had twelve months' or more experience in industry may present a report which, if satisfactory, will be accepted in lieu of the above requirements.

719-720. Chemical Engineering Operations. Three credit hours. 719, Autumn and Winter Quarters; 720, Winter and Spring Quarters. One three-hour lecture recitation and computational period each week. General prerequisites must include physical chemistry and Chemical Engineering 692 or equivalent except with special permission of the instructor. Mr. Koffolt, Mr. E. E. Smith.

A continuation of the study of engineering operations constituting the body of Chemical Engineering concerned with those operations largely utilized where liquids and gases are concerned, such as evaporation, distillation, drying, absorption, etc. Emphasis is placed upon the concept of separation, such as the engineering requirements of the separation of solids from solids, from liquids, from gases; liquids from solids, from liquids, etc. Emphasis is laid on computational problem work.

Not open to students who have credit for Chemical Engineering 716-717-718.

740. Chemical Engineering Measurements and Control. Three credit hours. One Quarter. Winter and Spring. Two lectures and conferences and one four-hour laboratory. For Chemical Engineering majors Chemical Engineering 720 must be included in the general prerequisites or taken concurrently; for others, general prerequisites must include senior standing in a scientific or technical curriculum, one year of calculus, one year of college physics, and permission of the instructor. Mr. Geankoplis, Mr. Rebert, and assistants.

Study of the principles employed in the measurement and control of the physical and chemical variables of chemical processes and the application of these principles to design and use of industrial instruments.

Elective for students in the College of Arts and Education and in the Graduate School.

Not open to students who have credit for Chemical Engineering 771.

741. Chemical Engineering Operations Laboratory. Four to eight credit hours. General prerequisites must include Chemical Engineering 720 and 740, or equivalent. Mr. Koffolt, Mr. Syverson, Mr. Rebert, and assistants.

The fundamental laboratory course in chemical engineering concurrent with a series of lecture conferences and problems on the theory of chemical engineering operations. Laboratory study and investigation of the operating characteristics and efficiency of equipment utilized in carrying out the more important chemical engineering operations, such as fluid flow, heat transfer, distillation, etc. Standard American Society for Testing Materials methods with standard equipment are also integrated in this course.

753-754. Chemical Engineering Thermodynamics. Three credit hours. 753, Winter and Spring Quarters; 754, Spring and Summer Quarters. One three-hour lecture, recitation, and computational periods each week. General prerequisites must include physical chemistry. Mr. Kay, Mr. E. E. Smith.

Application of the fundamental concepts and laws of thermodynamics to problems of chemical industry. The work of the course includes: first, second and third laws of thermodynamics, thermodynamic functions, equations of equilibrium, pressure-volume temperature relations of fluids, thermodynamic properties and diagrams, heat effects of physical and chemical processes, chemical equilibria and estimating thermodynamic properties of industrial substances. Emphasis is laid on computational problem work with particular reference to its application in industrial practice.

Not open to students who have credit for Chemical Engineering 750-751-752.

760. Chemical Engineering Economy. Two credit hours. Autumn Quarter. One lecture, one two-hour computational laboratory, and three hours of

preparation each week. General prerequisites must include Chemical Engineering 741, concurrent with Chemical Engineering 770, except with special permission of the instructor. Mr. Syverson, Mr. Rebert.

The background, organization, management and economic problems found in chemical engineering industries. The work of the course emphasizes computational work dealing with the following factors in Chemical Engineering reports: major products, by-products, choice of process, plant location, selection of chemical engineering equipment, transportation, labor, research, pilot plant developments, patents, and cost accounting for chemical industries.

761-762. Chemical Technology. Three credit hours. Winter and Spring Quarters. Two lecture hours and one two-hour computational laboratory period each week. Chemical Engineering 720, 754, 760 must be included in the general prerequisites or taken concurrently, or with special permission of the instructor. Mr. Syverson, Mr. Rebert.

Study of the problems of a number of important chemical industries. Course includes the close integration of Chemistry, Engineering, and Economics, based upon fundamental concepts in these fields. Computation for the selection of optimum sizes of equipment and operating conditions. Inter-commodity and inter-process relationships of the chemical industry. The work of the Winter Quarter deals especially with the inorganic industries, while that of the Spring Quarter is related to the organic industries.

763. Applied Electrochemistry. Three credit hours. Spring Quarter. Given in odd numbered years. Three lectures each week. General prerequisites must include Chemistry 683 or special permission of the instructor must be obtained. Mr. Syverson.

A survey of the electrochemical industries and a discussion of the principles underlying the application of the electric current in chemical industries. Quantitative relationships and application of thermodynamics are stressed, requiring the solution of numerous problems.

770. Chemical Process Development. Two to five credit hours. Autumn Quarter. One hour conference and five to fourteen laboratory hours each week. Chemical Engineering 741-760, or equivalent, must also be included in these general prerequisites or taken concurrently. Mr. Syverson.

Introduction to laboratory research and pilot plant development, process design, and manufacturing cost estimating. A project is developed from the research laboratory stage to the construction and operation of a 150 pound pilot plant and finally to the process design and manufacturing cost estimate for a full scale plant. Experimental data are obtained by the whole class acting as a research and development organization with each individual in charge of some phase of the work. A preliminary process design and cost estimate is made based upon the pilot plant data.

791. Special Project Problem Investigations. Five or six credit hours. Autumn, Winter, and Spring Quarters. Conferences and laboratory work. General prerequisites must include Chemical Engineering 790, except by special permission. Department Staff.

Individual laboratory work on some problem chosen to develop power of independent investigation, with the understanding that preliminary separate reports on both analysis and planning of experimental work undertaken will be required before experimental attack on the problems themselves, involving special attention to hazards and safety measures.

Students may repeat this course with credit with the approval of the instructor. Elective for students in the Graduate School.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

801. Advanced Special Problems in Chemical Engineering and Chemical Technology. Credit hours to be arranged. Autumn, Winter, and Spring Quarters. Conference, library and laboratory work. General prerequisites must include satisfactory courses in the field of the problem undertaken. The course may be repeated on other problems as desired. Department staff.

The work of the course is carried on by individual conference, library, and laboratory work and consists of problems involving application of physics, mathematics, drawing, mechanics, chemistry, economics, and general thermodynamics in the field of chemical engineering and chemical technology. This is a graduate course in minor problems covering the chemical engineering operations, instrumentation, chemical engineering, thermodynamics and chemical technology.

815. Advanced Chemical Engineering Operations. Three credit hours. One Quarter. Autumn, Winter, Spring. One three-hour lecture, recitation, and computational period each week. General prerequisites must include Chemical Engineering 720 and 741, or equivalent. Mr. Koffolt, Mr. Lapple, Mr. Geankoplis.

This course is intended to give the advanced student courses in the advanced phases of the chemical engineering operations.

- a. The diffusional operations, absorption, and adsorption.
- b. Advanced binary and multicomponent distillation.
- c. Extraction, extractive and azeotropic distillation.
- d. Advanced heat transfer.
- e. Radiation, heat transfer in the unsteady state, and the applications of heat transfer to design and operation.
- f. Drying, humidification, and dehumidification.
- g. Advanced fluid flow as applied to problems of chemical industry.
- h. Applications of the chemical engineering operations to problems in the organic chemical industries as: nitration, sulfonation, hydrogenation, oxidation, polymerization, etc.
- i. The newer chemical engineering operations as dialysis, atmolysis, hypersorption, etc.
- j. Advanced combustion principles covering newer rocket and jet fuels.
- k. Fluidization.
- l. Dust and mist collection.

A student may repeat this course until he has obtained a maximum of twenty-one credit hours. With the exception of topic "i," a student may not accumulate more than three credit hours in any of these topics. Approval of more than three credit hours in topic "i" requires the approval of the adviser and chairman of the graduate committee of the department.

820-821. Advanced Chemical Engineering Thermodynamics. Three credit hours. Autumn and Winter Quarters. One three-hour lecture, recitation, and computational period each week. General prerequisites must include Chemical Engineering 720, 754, or equivalent. Mr. Kay.

Detailed discussion of special topics as: Pressure-volume temperature relations of pure compounds and liquid gaseous mixtures; Equations of State; Vaporization and Condensation Equilibria; Azeotropism; Properties of Solids and Liquids at Extreme Pressures; Discussion of current technical and scientific literature in the field. Computational problem work will emphasize application of thermodynamics in industrial practice.

830-831. Chemical Engineering Kinetics. Three credit hours. Winter and Spring Quarters. One three-hour lecture, recitation and computational period each week. General prerequisites must include Chemical Engineering 720, 754, or equivalent. Mr. Syverson, Mr. Geankoplis.

A course in chemical engineering kinetics dealing with kinetics from the viewpoint of industrial chemical processes.

861-862. Advanced Chemical Technology. Three credit hours. Winter and Spring Quarters. Two lectures and one two-hour computational laboratory period each week, and individual conferences. General prerequisites must include Chemical Engineering 720, 754, 760, 815, or 820, 880 or equivalent. Mr. Syverson.

861. Application of chemical engineering operations, thermodynamics, and reaction kinetics for the solution of problems in chemical process engineering. Economic balance studies. Principles of reactor design and application to industrial scale chemical reactions.

862. Application of process engineering principles to several important chemical industries. Economic trends and relationships between raw materials and manufactured products for several basic inorganic and organic chemicals. Recent advances in chemical technology.

870. Advanced Chemical Process Development. Five credit hours. Autumn Quarter. One hour conference and fourteen laboratory hours each week. Chemical Engineering 760 and 880 must be included in the general prerequisites or be taken concurrently. Mr. Syverson.

Advanced course involving the development of a practical process for the manufacture of an assigned chemical. Emphasis is placed on originality directed toward finding new or improved methods. Course work includes: literature survey, preliminary economic evaluation, laboratory research, small scale manufacturing unit, process design and selection of equipment, and manufacturing cost estimate.

880-881-882. Advanced Chemical Engineering Operations Laboratory. Two to six credit hours. Autumn, Winter, and Spring Quarters. One conference and five to seventeen laboratory hours each week. General prerequisites must include Chemical Engineering 720, 754 and prerequisite or concurrent Chemical Engineering 741 or equivalent or special permission of the chairman of the department must be obtained. Mr. Koffolt.

An advanced course of minor problems dealing with various chemical engineering equipment with the view of acquainting students with all types of equipment, their design, and operation. The application of thermodynamics and graphics to chemical engineering problems.

The conferences cover topics chosen from the field of chemical engineering. Specific topics are given each Quarter.

Students may repeat these courses with credit, with the approval of the chairman of the department, inasmuch as the topics vary from year to year. The following is a list of topics from which work in this course is chosen: Graphical Chemical Engineering Computations, Drying, Humidification, Dehumidification, Adsorption, Absorption, Fume and Smoke, Crystallization, Filtration, Crushing and Grinding, Furnace and Pyrometry, Evaporation, Refrigeration, Distillation, Cracking, Heat Transfer, and Flow of Fluids.

900-901-902. Advanced Industrial Chemistry and Chemical Engineering. Credit hours to be arranged. Autumn, Winter, and Spring Quarters. One hour conference and five to fourteen laboratory hours each week. General prerequisites must include acceptable courses in industrial chemistry, or the permission of the instructor must be obtained. Department staff.

An advanced course dealing with the solution of minor problems in industrial chemistry and chemical engineering. Special work will be planned along lines in industrial chemistry or chemical engineering as may be desired by the individual student.

905-906-907. Seminar in Industrial Chemistry and Chemical Engineering. Two credit hours. Autumn, Winter, and Spring Quarters. Two conference hours each week. General prerequisites must include satisfactory courses in industrial chemistry and chemical engineering. Mr. Koffolt, Mr. Kay, Mr. Lapple, Mr. Syverson, Mr. Geankoplis.

The course consists of conferences and reports upon methods of attacking special problems in industrial chemistry and chemical engineering. The topics vary from Quarter to Quarter, keeping in touch with the constant development of chemical industry and chemical engineering.

950. Research in Industrial Chemistry and Chemical Engineering. Credit hours to be arranged. Autumn, Winter, and Spring Quarters. Library, conference, and laboratory work. General prerequisites must include satisfactory courses in the chosen field of research. Mr. Koffolt, Mr. Withrow, Mr. Herndon, Mr. Kay, Mr. Lapple, Mr. Syverson, Mr. Geankoplis, Mr. Kerr, Mr. Krumin, Mr. Sheets, Mr. Smith.

Advanced research problems and dissertation in any one of the following fields depending upon undergraduate approach:

- a. Chemical Engineering
- b. Industrial Chemistry
- c. Applied Electrochemistry

CHEMISTRY

Office, 116 McPherson Chemical Laboratory
General Chemistry Office, 115 McPherson Chemical Laboratory

PROFESSORS MACK, EVANS (EMERITUS), HENDERSON (EMERITUS), FOULK (EMERITUS), BOORD (EMERITUS), MOYER, WOLFROM, HENNE, NEWMAN, GARRETT, HASKINS, HARRIS, LASSETTRE, MacNEVIN, AND VERHOEK, ASSOCIATE PROFESSORS MacWOOD, CALEY, SISLER, VAN WINKLE, AND WATTERS, NON-RESIDENT ASSOCIATE PROFESSOR ROTHMUND (KETTERING FOUNDATION, ANTIOCH COLLEGE), ASSISTANT PROFESSORS HOLLINGSWORTH (EMERITUS), MALMBERG, SHECHTER, RUBIN, SWEET, CALVERT, TAYLOR, AND KURBATOV

Prerequisite for Graduate Work: The student must have had approximately 80 Quarter hours (32 semester hours) of undergraduate work in chemistry. This requirement must include general inorganic chemistry, qualitative and quantitative analysis, introductory courses in organic and physical chemistry, including laboratory work in all subjects.

Requirements for the Master's Degree: (a) The course requirements for the Master's degree are not rigidly fixed, but the program of work should lead to an adequate and well-rounded

foundation for advanced work. These courses should be supplemented by others selected from the candidate's field of specialization and in conference with his adviser. (b) The candidate must give evidence of his ability to read chemical papers in either French or German. (c) About two weeks prior to the date proposed for conferring the degree the candidate must pass a written examination. Should the graduate record of the candidate be wholly satisfactory, the scope of the examination would be confined to the candidate's field of specialization.

Requirements for the Degree of Doctor of Philosophy: (a) The Department of Chemistry requires certain broad general courses of the graduate student during his first year. These courses include a study of the thermodynamic approach to chemical problems, and advanced courses in organic chemistry. Systematic courses in experimentation are offered and are strongly recommended. A satisfactory performance in these general courses is required of the student who expects to undertake a research and to become a candidate for the Doctor's Degree. (b) The student should acquire such broad mastery of his chosen field in Chemistry as may be reasonably expected of a professional chemist, and such background as may be acquired from the advanced courses and seminars offered by the Department and from laboratory experience and from the chemical literature (especially current literature). The graduate student is encouraged to avail himself of graduate courses in related fields offered by such Departments as Physics, Mathematics, Mineralogy, Physiological Chemistry, and Bacteriology. For admission to candidacy the student must pass satisfactorily an examination at a time that correspondents as nearly as possible to the beginning of his third year of graduate study. The examination will be written and oral, and will be largely limited to the student's field of specialization in Chemistry. (c) Further, German, as determined by special examinations. (d) An acceptable dissertation and a final oral examination on the dissertation and related aspects of Chemistry are required.

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

647-648. Organic Chemistry. Three credit hours each. 647, Autumn and Spring; 648, Winter and Summer. Three lectures or recitations each week. General prerequisites must include acceptable courses in general and analytical chemistry. Mr. Wolf from, Mr. Malmberg.

A fundamental course in organic chemistry. Chemistry 647 is devoted to a discussion of the aliphatic hydrocarbons and their derivatives and Chemistry 648 to a discussion of the coal tar compounds.

Not open to students who have credit for Chemistry 451-452. Not available for graduate credit for students majoring in chemistry.

649. Organic Chemistry: Laboratory. Three credit hours. One Quarter. Autumn and Spring. Nine laboratory hours each week. Chemistry 647 must be included in the general prerequisites or taken concurrently. Mr. Wolf from, Mr. Malmberg.

The laboratory work naturally belonging to Chemistry 647. The preparation of a series of typical organic compounds, their purification, and a study of their properties.

Not open to students who have credit for Chemistry 451-452. Not available for graduate credit for students majoring in chemistry.

650. Organic Chemistry: Laboratory. Two or three credit hours. One Quarter. Winter and Summer. Nine laboratory hours each week. General prerequisites must include Chemistry 649; Chemistry 648 must be included in the general prerequisites or taken concurrently. Mr. Malmberg, Mr. Wolf from.

A continuation of Chemistry 649.

Not available for graduate credit for students majoring in chemistry.

655-657-659. Organic Chemistry. Three credit hours. Three Quarters. Autumn, Winter, Spring. Three lectures or recitations each week. General prerequisites must include acceptable courses in general and analytical chemistry. Mr. Henne, Mr. Shechter.

A fundamental course in organic chemistry. Chemistry 655 is devoted to the study of the simple aliphatic hydrocarbons and their monofunctional derivatives. Chemistry 657 is a continuation of Chemistry 655 and covers polyfunctional derivatives including carbohydrates and proteins. It also includes cyclic hydrocarbons, their derivatives and aromatic compounds. Chemistry 659 is a continuation of 657 and covers the more complex aromatic products including dyes, terpenes, heterocyclic compounds, vitamins, hormones and other natural products.

Chemistry 655-657 are not open to students who have credit for Chemistry 451-452 or Chemistry 647-648.

Not available for graduate credit for students majoring in chemistry.

656-658-660. Organic Chemistry: Laboratory. Two or three credit hours. Three Quarters. Autumn, Winter, Spring. Six or nine laboratory hours each week. Chemistry 655-657-659 must be included in the general prerequisites or taken concurrently. Mr. Henne, Mr. Shechter.

The preparation of typical organic compounds, their purification and the study of their properties. Particular emphasis is laid on laboratory techniques and class reactions. Chemistry 660 is largely devoted to qualitative organic analysis.

Chemistry 656-658 are not open to students who have credit for Chemistry 451-452 or Chemistry 649-650.

Not available for graduate credit for students majoring in chemistry.

670. Physical Chemistry. Five credit hours. Spring Quarter. Five lectures each week. General prerequisites must include fifteen Quarter hours of college mathematics, ten Quarter hours of general physics, and ten Quarter hours of organic chemistry. Mr. Van Winkle.

A non-mathematical study of the fundamental principles of physical chemistry arranged for students in the biological sciences or in other non-chemical fields.

Not available for graduate credit for students majoring in chemistry.

Not open to students who have credit for Chemistry 563.

680. Physical Chemistry. Five credit hours. Autumn Quarter. Five lectures and recitations each week. Mr. Taylor.

Properties of gases, liquids, and solutions; chemical bonds; chemical equilibria; phase rule; electrolytes, colloids, and electrical phenomena; thermodynamics.

681. Physical Chemistry. Three credit hours. Autumn Quarter. Three lectures each week. Acceptable courses in physics and two Quarters of calculus must be included in the general prerequisites or taken concurrently. It is recommended that Chemistry 691 be taken concurrently. Mr. Harris, Mr. Mack, Mr. Van Winkle.

The fundamental course in physical chemistry.

Not available for graduate credit for students majoring in chemistry.

682. Physical Chemistry. Three credit hours. Winter Quarter. Three lectures each week. General prerequisites must include Chemistry 681. It is recommended that Chemistry 692 be taken concurrently. Mr. Harris, Mr. Mack, Mr. Van Winkle.

A continuation of Chemistry 681.

Not available for graduate credit for students majoring in chemistry.

683. Physical Chemistry. Three credit hours. Spring Quarter. Three lectures each week. General prerequisites must include Chemistry 682. It is recommended that Chemistry 693 be taken concurrently. Mr. Harris, Mr. Mack, Mr. Van Winkle.

A continuation of Chemistry 682.

Not available for graduate credit for students majoring in chemistry.

690. Physical Chemistry Laboratory. Three credit hours. One Quarter. Autumn and Spring. One hour of conference and eight laboratory hours each week. An acceptable lecture course in physical chemistry must be included in the general prerequisites or be taken concurrently. Mr. Van Winkle.

This course is a duplication of parts of Chemistry 691, 692, and 693, and is offered especially for the engineers for the new five-year program in Chemical Engineering.

691-692-693. Physical Chemistry: Laboratory. Two credit hours. Autumn, Winter, and Spring Quarters. Six laboratory hours each week. An acceptable course in physical chemistry must be included in the general prerequisites or taken concurrently. These courses are designed to accompany Chemistry 681, 682, and 683, respectively. Mr. Van Winkle and assistants.

Quantitative measurements of phenomena of chemical interest and the application of chemical principles to their interpretation. The measurements include experiments in the determination of molecular weights and chemical constitution, thermochemistry, reaction rates, equilibria, electrochemistry, colloid chemistry, high vacuum, and glass blowing techniques, etc.

701. Minor Problems in Chemistry. One to fifteen credit hours. Any Quarter. Conference, library, and laboratory work. General prerequisites must include satisfactory courses in the field of the problem undertaken. A student may repeat this course and may spend all or any part of his time on it during a Quarter. Department Staff.

This course is designed to permit any properly qualified person to avail himself of the library and laboratory facilities of the department for carrying out a minor investigation or for adding to his knowledge and technique in some chemical subject. A student may exercise entire freedom in his choice of instructor to conduct his work in this course.

721. Advanced Analytical Chemistry. Three or five credit hours. Autumn Quarter. Three lectures and two three-hour laboratory periods each week. General prerequisites must include Chemistry 648, 683 or their equivalent. Mr. Caley.

The course includes the theory and practice of sampling, preparation of refractory materials for analysis, special methods of precipitation, organic reagents in inorganic analysis, recent advances in volumetric analysis, and a critical study of methods of separation with special reference to complex materials. Mr. Caley.

The course may be taken for three credit hours without laboratory work or for five credit hours with laboratory work.

722-723. Advanced Instrumental Analysis. Four credit hours each. Winter and Spring Quarters. Two lectures and two three-hour laboratory periods each week. General prerequisites must include Chemistry 683, or its equivalent. Mr. Moyer, Mr. MacNevin.

The general principles and methods of instrumental analysis. The laboratory work includes pH determinations, potentiometric and conductometric titrations and the application of high frequency oscillator systems to chemical analysis. Chemistry 723 is a continuation of Chemistry 722. The laboratory work includes electrolytic analysis, coulometric analysis, and polarography.

726. Inorganic Micro Analysis. Four credit hours. Winter Quarter. One lecture and nine laboratory hours each week. General prerequisites must include acceptable courses in quantitative analysis and inorganic or physical chemistry. Mr. MacNevin.

Applications of micro, semimicro and microscopic methods to common problems.

728. Spectroscopic Analysis. Four credit hours. Autumn Quarter. Two lectures and two three-hour laboratory periods each week. General prerequisites must include Chemistry 680 and 683 or their equivalent. Mr. Watters.

The theory and the use of the spectrograph in the qualitative identification and the quantitative determination of the elements. Applications of emission spectra in the analysis of metallurgical and biological materials.

729. Chemical Spectrophotometry. Four credit hours. Winter Quarter. Two lectures and two three-hour laboratory periods each week. General prerequisites must include Chemistry 680 or Chemistry 683, or their equivalent. Mr. Watters.

The application of infrared, visible, and ultraviolet spectra to general problems of molecular structure. Spectrophotometric methods applied to organic and inorganic analysis.

741. Qualitative Organic Analysis. Four credit hours. Spring Quarter. One lecture and nine laboratory hours each week. General prerequisites must include twelve credit hours of organic chemistry including laboratory work. Mr. Wolfrom.

A study of the systematic methods of separation, purification, and identification of organic compounds.

742. Organic Micro Quantitative Analysis. Four credit hours. Autumn Quarter. One lecture and nine laboratory hours each week. General prerequisites must include acceptable courses in quantitative analysis and organic chemistry. Mr. MacNevin and assistants.

This is primarily a course in quantitative organic analysis using micro methods. The common determinations of organic quantitative analysis are studied.

751. Radiochemistry. Three credit hours. Autumn Quarter. Three lec-

tures each week. General prerequisites must include Chemistry 681-682-683 or their equivalent. Mr. Garrett.

A consideration of some of the properties of the nucleus, nuclear reactions, selection and preparation of isotopes for tracer work, health hazards and protection, and the application of radioactive isotopes to some common chemical problems.

Prior or concurrent registration in Physics 615 is helpful in this course.

754. X-rays and Crystal Structure. Four credit hours. Winter Quarter. Three lectures and one three-hour laboratory period each week. General prerequisites must include calculus and one year of college physics. Mr. Harris.

An introduction to the methods of X-ray crystal analysis. Theory of symmetry of crystals and of diffraction will be discussed and applied in connection with the conventional single crystal and powder methods of structure analysis.

755. X-ray and Electron Diffraction. Three credit hours. Spring Quarter. Three lectures each week. This course is designed to follow Chemistry 754. Mr. Harris.

An extended consideration of the theory of X-ray and electron diffraction and their applications including Fourier methods of parameter determination in crystals, etc.

761. Advanced Inorganic Chemistry. Three credit hours. Autumn Quarter. Three lectures or recitations each week. General prerequisites must include Chemistry 681-682-683, or their equivalent. Mr. Sisler, Mr. Rubin.

An elementary discussion of the theory of atomic structure and the electronic configuration of the elements in relation to the periodic system, followed by an introduction, on a non-mathematical basis, to the modern theory of the chemical bond.

A systematic study of the families of the elements and their compounds will be included. Emphasis will be placed (1) on the equilibria and factors influencing the speed of reactions, and (2) on the relation of properties of the elements and their compounds to atomic and molecular structures.

762. Advanced Inorganic Chemistry. Three credit hours. Winter Quarter. Three lectures or recitations each week. General prerequisites must include Chemistry 761. Mr. Rubin, Mr. Sisler.

A continuation of Chemistry 761.

***763. Advanced Inorganic Chemistry.** Three credit hours. Spring Quarter. Three lectures or recitations each week. General prerequisites must include Chemistry 762. Mr. Sisler, Mr. Rubin.

A discussion of special topics in modern inorganic chemistry, including an introduction to the chemistry of substances in non-aqueous solvents, acid-base theory and inorganic complex compounds.

764. Advanced Inorganic Chemistry. Three credit hours. Spring Quarter. Three lectures or recitations each week. General prerequisites must include Chemistry 762. Mr. Sisler, Mrs. Kurbatov.

A study of the transition metals. The periodic table relationships, electronic configurations, thermodynamic properties, oxidation states, complex compounds, and methods of separating these elements will be discussed. Recent research in these fields will be reviewed.

***769. Solution of Electrolytes.** Three credit hours. Spring Quarter. Three lectures each week. General prerequisites must include Chemistry 681-682-683, or their equivalent. Given in alternate years. Mr. Verhoek.

A consideration of the properties of electrolytic solutions, the Debye-Hückel theory, the strength of acids and bases in various solvents, solubility of electrolytes in various solvents, and conductivity of solutions of electrolytes.

Not open to students who have credit for Chemistry 768.

772. Inorganic Chemistry: Laboratory. Three credit hours. Winter Quarter. Nine laboratory hours each week. General prerequisites must include acceptable courses in general chemistry, quantitative analysis, and Chemistry 681, 682, 683. Mr. Rubin, Mr. Sisler.

Minor problems in the use of modern techniques in the field of synthetic and physical organic chemistry including the use of liquified gases, low temperature and high temperature apparatus, high pressure and high vacuum apparatus, oxygen-free systems, etc.

* Not given in 1954-1955.

775. The Phase Rule. Three credit hours. Spring Quarter. General prerequisite must include Chemistry 683. Mr. MacWood.

The phase rule and its applications to chemical problems.

777. Photochemistry. Three credit hours. Spring Quarter. Three lectures each week. General prerequisites must include Chemistry 683. Mr. Rubin.

An advanced course covering the experimental techniques used in photochemistry. A detailed discussion will be given to the mechanisms of representative gas reactions which can be initiated by light.

782. Chemical Bibliography. One credit hour. Autumn Quarter. One conference each week. General prerequisites must include acceptable courses in analytical and organic chemistry. Mr. Wolfrom.

Designed to train the advanced student in the use of the chemical library, and to instruct him in the character of various chemical journals, dictionaries, reference books, and other sources of information pertaining to chemical subjects.

784. History of Chemistry. Two credit hours. Spring Quarter. Two lectures each week. General prerequisites must include acceptable courses in analytical and organic chemistry. Mr. Caley.

A general course in the history of chemistry with special reference to the development of the theories of the science.

795. Colloid Chemistry. Three credit hours. Winter Quarter. Three lectures or recitations each week. General prerequisites must include acceptable courses in physical chemistry or their equivalent. Mr. Van Winkle.

A fundamental course in colloid chemistry.

796. Theoretical Electrochemistry. Three credit hours. Autumn Quarter. Three lectures or recitations each week. General prerequisites must include acceptable courses in physical chemistry or their equivalent. Mr. Rubin.

A fundamental course in theoretical electrochemistry.

NOTE: TEACHING COURSES. For the Teaching Course in this department see the Department of Education, Course 684.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

These prerequisites include a thorough preparation in general inorganic chemistry, qualitative and quantitative analysis and introductory courses in organic chemistry and in physical chemistry (including laboratory courses in both subjects), acceptable courses in physics and mathematics, including calculus.

801-802-803. Systematic Course in Experimentation. Three credit hours. 801, Autumn Quarter; 803, Winter Quarter; 802 Spring Quarter. Nine laboratory hours each week, including informal conferences. Required of all graduate students intending to become candidates for the Ph.D. degree. Mr. Harris, Mr. Henne, Mr. MacNevin, Mr. Taylor, and Department Staff.

A training in the fundamental experimental technique of chemical research. Glass-blowing, some shop practice, high vacuum techniques, construction of furnaces, measurement and control of temperature, electrical and optical instruments, fractional distillation and crystallization, criteria of purity, calibration, study of errors, micro manipulation, etc.

822. Seminar in Analytical Chemistry. Two credit hours. Winter Quarter. Two conferences each week. Mr. Caley.

Topic for 1954-1955: To be announced.

***823. Seminar in Analytical Chemistry.** Two credit hours. Autumn Quarter. Two conferences each week. Mr. Moyer.

824. Seminar in Analytical Chemistry. Two credit hours. Spring Quarter. Two conferences each week. Mr. MacNevin.

Topic for 1954-1955: The Platinum Group Metals.

* Not given in 1954-1955.

*825. Seminar in Analytical Chemistry. Two credit hours. Spring Quarter. Two conferences each week. Mr. Watters.

*826. Seminar in Analytical Chemistry. Two credit hours. Winter Quarter. Mr. Sweet.

839. High Polymers. Three credit hours. Spring Quarter. Mr. Haskins, Mr. Verhoek, Mr. Van Winkle.

An introduction to the chemistry and properties of high polymers, including the principles of organic chemistry involved in their preparation, the kinetics of polymerization reactions, and the properties of their solutions from the point of view of physical chemistry.

841. Advanced Organic Chemistry. Three credit hours. Autumn Quarter. Three lectures each week. Mr. Henne.

An advanced course in the fundamental principles of organic chemistry, covering the chain hydrocarbons and their derivatives.

842. Advanced Organic Chemistry. Three credit hours. Winter Quarter. Three lectures each week. Mr. Newman.

A continuation of Chemistry 841, covering the carbocyclic compounds, including aromatic, hydroaromatic, and terpene derivatives.

843. Advanced Organic Chemistry. Three credit hours. Spring Quarter. Three lectures each week. Mr. Wolfrom.

A continuation of Chemistry 841 and 842 covering the heterocyclic compounds with special emphasis upon nitrogen derivatives.

844-845. Advanced Organic Chemistry: Laboratory: Three credit hours. 844, Autumn Quarter; 845, Winter Quarter. Nine hours of library conference, and laboratory work each week. Chemistry 841 and 842 must be included in the general prerequisite or taken concurrently. Mr. Newman, Mr. Henne.

An advanced course designed to develop a broad background in synthetic organic chemistry involving special techniques. The use of fractionating columns, high pressure hydrogenation, vapor phase reactions, reactions in liquid hydrogen fluoride, chromatographic separation, electrolytic reduction, ozonization and resolution of an optically active substance are typical of the experiments. Emphasis is placed on semi-quantitative manipulation of reaction products and the attainment of high purity. Some experiments are assigned for which no exact description is available in the literature.

847. Theoretical Organic Chemistry. Three credit hours. Autumn Quarter. Three lectures or discussions each week. General prerequisites must include one year of graduate work in chemistry including Chemistry 841 and 842 or their equivalent. Mr. Shechter, Mr. Cava.

A discussion of the structural theory of organic chemistry, tetravalent carbon, homology, chemical and physical isomerism and stereochemistry.

848. Theoretical Organic Chemistry. Three credit hours. Winter Quarter. Three lectures or discussions each week. General prerequisites must include one year of graduate work in chemistry including Chemistry 841 and 842 or their equivalent. Mr. Shechter, Mr. Cava.

A discussion of molecular rearrangements, including the theories which have been evolved for their explanation.

849. Theoretical Organic Chemistry. Three credit hours. Spring Quarter. Three lectures or discussions each week. General prerequisites must include one year of graduate work in chemistry including Chemistry 841 and 842 or their equivalent. Mr. Shechter, Mr. Cava.

A discussion of the nature and types of organic reactions, including theories and reaction mechanism.

850. Seminar in Organic Chemistry. Three credit hours. Autumn Quarter. Three conference hours each week. General prerequisites must include Chemistry 841 and 842. Mr. Wolfrom.

Topic for 1954-1955: Determinative Organic Structure.

* Not given in 1954-1955.

851. Seminar in Organic Chemistry. Three credit hours. Winter Quarter. Three conference hours each week. General prerequisites must include Chemistry 841 and 842. Mr. Shechter.

Topic for 1954-1955: Chemistry of Alicyclic Compounds.

***852. Seminar in Organic Chemistry.** Three credit hours. Spring Quarter. Three conference hours each week. General prerequisites must include Chemistry 841 and 842. Mr. Newman.

853. Seminar in Organic Chemistry. Three credit hours. Spring Quarter. Three conferences each week. General prerequisites must include Chemistry 841 and 842. Mr. Henne.

Topic for 1954-1955: The Triple Bond.

***854. Seminar in Organic Chemistry.** Three credit hours. Winter Quarter. Three conference hours each week. General prerequisites must include Chemistry 841 and 842.

Open to auditors and advanced students not working for credit.

***855. Seminar in Organic Chemistry.** Three credit hours. Spring Quarter. General prerequisites must include Chemistry 841 and 842. Mr. Haskins.

***856. Seminar in Organic Chemistry.** Three credit hours. Spring Quarter. General prerequisites must include Chemistry 841 and 842. Mr. Malmberg.

861. Quantum Chemistry. Three credit hours. Autumn Quarter. Three lectures each week. Mr. Lassettre.

The modern theory of the chemical bond is given and accompanied by a discussion of experimental results of the structures and properties of inorganic compounds of elements in the first period of the periodic classification. The following topics are treated: resonance energies, interatomic distances, bond energies, ionic character of covalent bonds, structures of simple inorganic substances.

862. Quantum Chemistry. Three credit hours. Winter Quarter. Three lectures each week. Mr. Lassettre.

A continuation of Chemistry 861. The following topics are discussed: directed covalent bonds involving d orbitals, structures of molecules and crystals, structures of ionic crystals, thermodynamic properties of gases as related to their structures.

863. Quantum Chemistry. Three credit hours. Spring Quarter. Three lectures each week. Mr. Lassettre.

A continuation of Chemistry 862. The structures and properties of metals and alloys, the electronic theory of metals.

866. Seminar in Inorganic Chemistry. Two or three credit hours. Spring Quarter. Two conferences each week. General prerequisites must include Chemistry 761 and 762. Mr. Sisler.

Topic for 1954-1955: Electron Deficient Compounds.

867. Seminar in Inorganic Chemistry. Two or three credit hours. Winter Quarter. General prerequisites must include 761, 762 or their equivalent. Mr. Garrett.

Topic for 1954-1955: Complex Inorganic Compounds.

881. Chemical Kinetics. Three credit hours. Autumn Quarter. General prerequisites must include Chemistry 681-682-683. Mr. Verhoek.

A study of the velocity of homogenous gas reactions; theory of absolute reaction rates; chain reactions.

882. Chemical Kinetics. Three credit hours. Winter Quarter. Three lectures each week. General prerequisites must include Chemistry 681, 682, and 683. Mr. Verhoek.

A study of the velocity of heterogeneous gas reactions and reactions in solution; contact catalysis; acidbase catalysis.

* Not given in 1954-1955.

***884. Atomic Structure and Spectra.** Three credit hours. Autumn Quarter. General prerequisites must include Chemistry 681, 682, 683, and Physics 726 and 727. Mr. MacWood.

Atomic structure is treated from the point of view of quantum theory. Topics treated include line and X-ray spectra, energy level diagrams, ionization and resonance potentials. Chemical applications include the periodic arrangements of the elements, valence, paramagnetism, adiabatic, demagnetization and photochemical phenomena.

***885. Molecular Spectra and Structure.** Three credit hours. Winter Quarter. General prerequisites must include Chemistry 647-648, 681-682-683 and Physics 726 and 727. Mr. MacWood.

Molecular structure is taken up from the quantum standpoint with particular emphasis on band spectra, the correlation of atomic and molecular electronic states, energy level diagrams worked out for some typical molecules, potential energy curves, optical dissociation, predissociation, fluorescence and Raman spectra, infra-red absorption, continuous absorption, isotope effects, ortho and para molecular states, the determination of bond distances and bond angles, quantum mechanical resonance, the strengths of linkage in organic molecules, and applications to chemical thermo-dynamics and photo-kinetics.

887-888-889. Thermodynamics. Three credit hours. Autumn, Winter, and Spring Quarters. 887-888, Mr. MacWood; 889, Mr. MacWood, Mr. Taylor.

Training in the use of thermodynamics as a tool for solving chemical problems. Topics to be discussed include: vapor pressure; solutions and solubility; molecular spectra; free energy; modern theories of electrolytic dissociation; galvanic cells; and the various features associated with the measurement and control of chemical equilibria.

Not open to students who have credit for Chemistry 787-788-789.

890. Seminar in Physical Chemistry. Three credit hours. Winter Quarter. Three conferences each week. Mr. Taylor.

Topic for 1954-1955: Disorder and Imperfections in Crystals.

891. Seminar in Colloid Chemistry and Electrochemistry. Three credit hours. Autumn Quarter. Three conferences each week. Mr. Van Winkle.

Topic for 1954-1955: Colloids of Biological Importance.

***892. Seminar in Physical Chemistry.** Three credit hours. Spring Quarter. Three conferences each week. General prerequisites must include Chemistry 681-682-683. Mr. Harris.

***893. Seminar in Physical Chemistry.** Three credit hours. Autumn Quarter. Three conferences each week. General prerequisites must include Chemistry 681-682-683. Mr. Lassetre.

***894. Seminar in Physical Chemistry.** Two credit hours. Winter Quarter. Two conferences each week. General prerequisites must include Chemistry 681-682-683. Mr. Verhoek.

***895. Seminar in Physical Chemistry.** Two credit hours. Winter Quarter. Two conferences each week. General prerequisites must include Chemistry 681-682-683. Mr. Garrett.

896. Seminar in Physical Chemistry. Three credit hours. Spring Quarter. Two conferences each week. General prerequisites must include Chemistry 887-888-889. Mr. MacWood.

Topic for 1954-1955: Low Temperature Thermodynamics.

***897. Seminar in Chemistry.** Three credit hours. Autumn Quarter. Three conferences each week. Mr. Mack.

898. Seminar in Nuclear Chemistry. Three credit hours. Winter Quarter. Mr. Kurbatov.

Topic for 1954-1955: Fundamentals in Nuclear Reactions.

***899. Seminar in Nuclear Chemistry.** Three credit hours. Winter Quarter. General prerequisites must include Chemistry 681-682-683. Mrs. Kurbatov.

* Not given in 1954-1955.

910. Colloquium in Analytical Chemistry. No credit hours. Autumn, Winter, and Spring Quarters. One meeting each week. Graduate students specializing in analytical chemistry are expected to attend. Mr. MacNevin and staff in Analytical Chemistry.

A discussion of current research in analytical chemistry.

911. Colloquium in Organic Chemistry. No credit hours. Autumn, Winter, and Spring Quarters. One meeting each week. Graduate students specializing in organic chemistry are expected to attend. Staff in Organic Chemistry.

A discussion of current research in organic chemistry.

912. Colloquium in Physical and Inorganic Chemistry. No credit hours. Autumn, Winter, and Spring Quarters. One meeting each week. Graduate students specializing in physical and inorganic chemistry are expected to attend. Mr. Lassettre and staff in Physical and Inorganic Chemistry.

950. Research in Chemistry. Autumn, Winter, and Spring Quarters. Library, conference, and laboratory work. General prerequisites must include acceptable courses in the chosen field of research. The student may spend a part or all of his time on research work. Department Staff.

Research is carried on in the fields of analytical, inorganic, organic and physical chemistry, and in colloid and electrochemistry.

NOTE: Attention is called to the fact that courses in physiological chemistry are listed elsewhere in this Bulletin under the Department of Physiological Chemistry and Pharmacology.

NOTE: For Industrial Chemistry, Applied Electrochemistry, and Chemical Engineering Courses see the Department of Chemical Engineering.

CIVIL ENGINEERING

Office, 107 Brown Hall

PROFESSORS LARGE, MORRIS (EMERITUS), SHANK, PRIOR (EMERITUS), KARRER, AND VANDEGRIFT, ASSOCIATE PROFESSORS MONTZ, COSENS, AND SMITH, MR. CRAIG

Graduate students working for an advanced degree, in addition to fulfilling the requirements found elsewhere in this bulletin, must have received from a college or university of approved standing either a Bachelor's degree in some branch of engineering or in the fundamental engineering sciences. In the case of a student with a Bachelor's degree in engineering, graduate credit will not be permitted for which equivalent courses were taken for undergraduate credit.

The graduate student without a Bachelor's degree in engineering must arrange his progress in accordance with the following regulations. He must expect to take additional work for which he will not receive graduate credit and which will lengthen his residence beyond three quarters.

- (1) The student must take, at this university, a minimum of five credit hours of plane surveying theory including field practice and also courses 401 and 403 in engineering drawing or he must submit credit for equivalent courses.
- (2) All stated prerequisites for graduate-credit courses must be taken at this university or credit must be submitted for equivalent courses taken elsewhere.
- (3) No more than one 600-level course shall be counted for graduate credit, and it shall not be in the major field. No basis courses such as 600-level mechanics or 600-level Civil Engineering courses, which are prerequisites for 700-level courses to be taken in the major field, shall be used for graduate credit. (Example: A student, whose major field is structures, shall not use Civil Engineering 610 for graduate credit, as it is a prerequisite for Civil Engineering 701.)
- (4) At least six Quarter hours of 800-level courses must be included.
- (5) From eight to ten Quarter hours of thesis, Civil Engineering 950, must be included.
- (6) The rest of the hours must be selected from the 700-level courses which are related to his particular field. Attention is brought to the paragraph earlier in the bulletin relative to "Grading System for Graduate Students."

It is important that the student's undergraduate work in Mathematics, Physics, Mechanics, and Chemistry be at least equal to the "Requirements for Admission" set forth earlier in this bulletin.

A graduate student may prosecute studies in the following branches in the field of Civil Engineering: (a) Structural Engineering, (b) Sanitary Engineering, (c) Highway Engineering, (d) Transportation Engineering, (e) Soil Mechanics and Foundations.

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

609. Adjustment of Observations. Three credit hours. Winter Quarter. Two lectures and four laboratory hours each week. General prerequisites must include calculus, railroad surveying and advanced surveying. Mr. Montz.

Theory of adjustment of observations.

610. Cement and Concrete. Four credit hours. Winter Quarter. One lecture, one recitation and two laboratory periods each week. General prerequisites must include Mechanics 602. Mr. Large, Mr. Craig.

A study of concrete materials and mixtures.

612. Soil Mechanics. Four credit hours. Autumn Quarter. Three lectures and one laboratory period each week. General prerequisites must include Civil Engineering 610 and Mechanics 602 and 610. Mr. Large, Mr. Craig.

Fundamental concepts of soil mechanics. Atterberg tests, capillarity, permeability, proctor compaction, consolidation and shear tests. Stress distribution.

615. Structural Detailing. Three credit hours. Winter Quarter. One lecture and five laboratory hours per week. General prerequisites must include an elementary course in engineering drawing and Civil Engineering 613 or 711. Mr. Smith, Mr. Shank.

Calculation and representation of structural connections, both riveted and welded, for detail drawings.

701. Reinforced Concrete Design. Five credit hours. Spring Quarter. Three recitations and two two-hour laboratory periods each week. General prerequisites must include Civil Engineering 610, 613, and Mechanics 605. Mr. Large, Mr. Shank.

Basic theory and design of reinforced concrete structures.

703. Water Supply Engineering. Five credit hours. Winter Quarter. Five recitations each week. General prerequisites must include Mechanics 602 and 610. Mr. Cosens.

Construction and operation of public water supplies.

705. Reinforced Concrete Structures. Five credit hours. Autumn Quarter. Five recitations each week. General prerequisites must include Civil Engineering 612 and 701. Mr. Large.

Application of principles of structural engineering to the design of footings, retaining walls and other reinforced concrete structures.

711. Elementary Structural Engineering. Three credit hours. One Quarter. Autumn, Winter, Spring. Three recitations each week. General prerequisites must include Mechanics 602. Mr. Shank, Mr. Montz, Mr. Vandegrift.

Theory and design of steel and reinforced concrete beams, columns and trusses.

Not open for graduate credit for students of the combined Bachelor-Master Program in Civil Engineering.

713. Reinforced Concrete Design. Five credit hours. Winter Quarter. Five recitations each week. General prerequisites must include ten hours of mechanics and Civil Engineering 711. Mr. Large, Mr. Shank, Mr. Vandegrift.

A basic course in reinforced concrete, with application to building design.

Not open for graduate credit for students of the combined Bachelor-Master Program in Civil Engineering.

715. Timber Design. Three credit hours. Winter Quarter. Two recitations and one three-hour laboratory period each week. General prerequisites must include Mechanics 605, and Civil Engineering 613. Mr. Montz, Mr. Karrer, Mr. Smith.

Lectures on wood and design practice in timber as applied to engineering structures.

716. Sewerage. Five credit hours. Spring Quarter. Five recitations each week. General prerequisites must include Mechanics 602 and 610. Mr. Cosens. Lectures and recitations upon sewerage systems, sewage and sewage treatment.

718. Water Treatment Plant Design. Three credit hours. Spring Quarter. One lecture and two three-hour laboratory periods each week. General prerequisites must include Bacteriology 634 and Civil Engineering 703. Mr. Cosens.

The incorporation of results of physical, chemical and bacteriological analyses of water and other controlling factors into the design of municipal water treatment facilities.

719. Industrial Wastes Treatment. Three credit hours. Winter Quarter. Three lecture hours each week. General prerequisites must include Civil Engineering 703 and 716. Mr. Cosens.

An introduction to the methods, processes and types of equipment used in the treatment of industrial and airborne wastes with emphasis for those students planning on entering the public health engineering field.

720. Sewage Treatment Plant Design. Three credit hours. Autumn Quarter. One lecture and two three-hour laboratory periods each week. General prerequisites must include Bacteriology 634 and Civil Engineering 716. Mr. Cosens.

Analysis of sewage and its correlation in the design and operation of sewage treatment facilities.

721. Highway Engineering. Five credit hours. Autumn Quarter. Five recitations each week. General prerequisites must include Civil Engineering 612 and a course in location surveying. Mr. Karrer.

A study of materials and principles of construction for rural highways and city pavements. Not open to students who have credit for Civil Engineering 605.

722. Traffic Engineering. Three credit hours. Autumn Quarter. Two recitations and one three-hour laboratory period each week. General prerequisites must include Civil Engineering 721. Mr. Karrer.

Trends in highway transportation; techniques for study and interpretation of such traffic characteristics as volumes, speeds, origin and destinations, congestion and accidents; application of traffic control measures such as through streets, one-way streets, speed control, parking regulations, traffic signs, signals, markings and street lighting and channelization.

723. Construction Methods and Equipment. Three credit hours. Spring Quarter. Two class hours and three laboratory hours each week. General prerequisites must include Civil Engineering 721. Mr. Karrer.

A study of the suitability of construction equipment and methods. Job management, time loss studies, and construction plant layout for highways, bridges, dams, buildings, and airports.

725. Advanced Soil Mechanics. Three credit hours. Spring Quarter. Three recitations each week. General prerequisites must include Civil Engineering 612 and a course in physical geology for engineers. Mr. Large, Mr. Craig.

Seepage, shearing strength of soils, stability of slopes, earth pressures, frost action.

728. Applied Hydraulics. Three credit hours. Spring Quarter. Three recitations each week. General prerequisites must include Mechanics 607 and 610 and Mechanical Engineering 673. Mr. Cosens.

Advanced applications of the principles of hydraulics to uniform and non-uniform flow in open channels. Analysis of complex pipe-flow networks.

Not open to students who have credit for Civil Engineering 614.

730. Transportation Engineering. Three credit hours. Winter Quarter. Three recitations each week. General prerequisites must include Civil Engineering 604 and a course in location surveying. Mr. Montz, Mr. Karrer.

Engineering costs illustrated by rail, highway, water, pipe line, and air transportation.

732. Contracts and Specifications. Three credit hours. Spring Quarter. Three recitations each week. Mr. Montz.

Professional practice and principles underlying engineering contracts and specifications.

733. Rigid Frame Structures. Three credit hours. One Quarter. Autumn and Spring. Concrete frames in the Autumn Quarter; Steel frames in the Spring Quarter. Three recitations each week. General prerequisites must include Mechanics 605 and a course in steel design or reinforced concrete design. Mr. Large, Mr. Vandegrift.

Analysis and design of rigid frame structures. Wind stress analysis.

734. Advanced Bridge Design. Three credit hours. Winter Quarter. Three recitations each week. General prerequisites must include Civil Engineering 613, 701 (or 713), and 733. Mr. Smith.

Stresses in and design of arch bridges.

738. Highway Location and Design. Three credit hours. Spring Quarter. Two recitations and one three-hour laboratory period each week. General prerequisites must include Civil Engineering 721. Mr. Karrer.

Principles and theory of the location and design of highways, city streets, freeways and parking facilities. Factors controlling alignment, grade, curves, intersections, lane-pattern, drainage and other facilities.

739. Bituminous Roads and Surfaces. Three credit hours. Winter Quarter. One recitation and two three-hour laboratory periods each week. General prerequisites must include Civil Engineering 721. Mr. Karrer.

Study of various types of bituminous roads now in use, plant layout and construction details, analysis of specifications and study of current literature on maintenance, renewals and surface treatments, laboratory tests of asphalts, tars, and oils.

799. Advanced Civil Engineering. Three to five credit hours. Autumn, Winter, and Spring Quarters. In addition to the general prerequisites, permission of the chairman of the department. All instructors.

This course is intended to give the advanced student opportunity to pursue advanced study. Work undertaken may be elected in the field of highways, structures, sanitary engineering, water supply, geodetic engineering, transportation, and other special fields in civil engineering.

- (a) Advanced Reinforced Concrete Design.
- (b) Geodetic Engineering.
- (c) Advanced Structural Design.
- (d) Advanced Sanitary Engineering.
- (e) Advanced Transportation Engineering.
- (f) Photogrammetry.
- (g) River Hydrology.
- (h) Special Problems in Soil Mechanics.

A student may repeat this course until he has obtained a maximum of twenty credit hours. He may accumulate not more than ten credit hours in any one of the above subdivisions.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

808. Geodesy. Three to five credit hours.* Autumn and Spring. Recitations and laboratory work to be arranged. General prerequisites must include Mathematics 608 and Civil Engineering 609.

Triangulation reconnaissance, use and computation of geographic coordinates, study of various systems of plane coordinates, the more common map projections, geodetic astronomy, and other problems involving the figure of the earth.

812. Foundations. Three credit hours. Spring Quarter. Three recitations each week. General prerequisites must include Civil Engineering 612, Mechanics 605, and a course in physical geology. Mr. Craig.

Methods of soil exploration, pile foundations, shallow foundations, caissons, and cofferdams.

814. Applied Soil Mechanics. Three credit hours. Autumn Quarter. Two lectures and one laboratory period each week. General prerequisites must include Civil Engineering 612, 721, and 725. Mr. Craig.

Lectures on special advanced problems in soil engineering, precise soil testing methods, application of soil test data to design.

825. Highway Administration. Three credit hours. Winter Quarter.

* The course may be taken in succeeding Quarters for a maximum of ten credit hours.

Three lectures each week. General prerequisites must include a course in statistical methods in engineering and Civil Engineering 722. Mr. Karrer.

Organization of highway departments for planning, designing, constructing, maintaining, and operating a system of roads and streets.

834. Advanced Structural Engineering. Three credit hours. Winter Quarter. Three lectures each week. General prerequisites must include Civil Engineering 613, 701 and 733. Mr. Large.

Haunched member continuity. Effect of concrete shrinkage and plastic flow. Ultimate strength design. Prestressed reinforced concrete design.

835. Vibration of Continuous Structures. Three credit hours. Spring Quarter. Three lectures each week. General prerequisites must include Civil Engineering 834 and Mechanics 607. Mr. Vandegrift.

Structural dynamics. Application of the theory of vibrations to the prediction of the performance of continuous beams, trusses, and bridges. Composite action.

Offered only in even-numbered years.

836. Structural Design by Elastic Energy. Three credit hours. Spring Quarter. Three lectures each week. General prerequisites must include Mechanics 816 and Civil Engineering 701. Mr. Vandegrift.

Application of the principles of elastic energy to the design of tunnel linings, curved beams, and arches.

Offered only in odd-numbered years.

840. Advanced Sanitary Engineering. Three to five credit hours.* One or two Quarters. Autumn and Spring. General prerequisites must include Civil Engineering 716 and 703, or equivalent. Mr. Cosens.

Individualized projects involving the design of water supply, water softening, sewerage, and sewage treatment plants for typical municipalities. Study of general sanitation and industrial waste disposal. Investigations.

842. Applied Hydrology. Three to five credit hours. Autumn Quarter. Recitations to be arranged according to credit hours received. General prerequisites must include Mechanics 610 and Civil Engineering 728 or Mechanical Engineering 673. Mr. Cosens.

Regimen of natural streams; flood routing; rainfall-runoff relationship; flood prediction; flood control; and control of alluvial streams.

950. Research in Civil Engineering. Credit hours to be arranged. Autumn, Winter, and Spring Quarters. All instructors.

CLASSICAL LANGUAGES AND LITERATURE

Office, 217 Derby Hall

PROFESSORS TITCHENER, BOLLING (EMERITUS), ABBOTT, AND FORBES,
ASSOCIATE PROFESSOR JONES

(See page 76 for the program in Ancient History and Literature.)

Prerequisites for Admission to Graduate Work: The student must have an undergraduate major (or its equivalent) in a university or college of recognized standing.

The field of study in the Department of Classical Languages includes all classical antiquity. Basic courses deal with the literature or literatures, the science of language study and methods of research, including an introduction to textual criticism. Specialization, particularly in the final year of graduate work, may lead to literary, linguistic, social, historical, economic or other aspects of ancient civilization.

Requirements for the Master's Degree: (a) *History and criticism of Latin (or Greek) literature.* If Latin is the major study, Greek is strongly advised but not required. (b) *Linguistics and Archaeology.* If one language only is studied, linguistics and archaeology must be substituted for the second language. (c) At least two Quarters of *methods of research.*

Requirements for the Degree Doctor of Philosophy: General Examinations—These general examinations, written and oral, are planned to determine the candidate's ability in the translation of Greek and Latin, knowledge of literary history, and specialized knowledge of a single author, chosen by the candidate in consultation with his adviser. Auxiliary fields, such as linguistics, archaeology, bibliography, and ancient history, will be included and in individual

* The course may be taken in succeeding Quarters for a maximum of ten credit hours.

cases such specialized subjects as palaeography, epigraphy, metrics, etc. (b) A wide knowledge of one literature, based on extensive reading, and a sound reading knowledge of the second. At least three Quarters of linguistics.

GREEK

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

631. Private Reading and Minor Problems. One to six credit hours. Autumn, Winter, and Spring Quarters. This course may be repeated for credit. General prerequisites should include a course in Homer. Mr. Jones.

Passages for private reading and topics for investigation will be suggested to meet the needs of individual students.

700. Advanced Reading. One to six credit hours. Autumn, Winter, and Spring Quarters. General prerequisites must include two Quarters of Greek 631, or six hours credit in Greek 631. Mr. Jones.

NOTE: For course in Principles of the Historical Study of Language, see German 705.

705-706-707. History of Greek Literature. Three credit hours. Autumn, Winter, and Spring Quarters. General prerequisites must include ten hours of advanced work in classics. The content of the readings within this course is so extensive that graduate students may repeat this course for credit. Mr. Jones.

Lectures and assigned reading on the development of Greek Literature; required and suggested passages for translation in each author studied.

LATIN

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

†603. Advanced Reading. Three credit hours. Summer Quarter. General prerequisites must include six Quarters of college Latin.

608. Roman Art and Archaeology. Three credit hours. Winter Quarter. General prerequisites must include for majors in Classical Languages, six Quarters of college Latin; for Fine Arts students, a course in the history of fine arts; other qualified students may be admitted by special arrangement. Mr. Jones.

Study of Roman architecture, sculpture, and painting. Lectures, discussions and reports on special topics.

612. Latin Prose Composition. Three credit hours. Winter Quarter. General prerequisites must include five Quarters of college Latin. Mr. Forbes.

Exercises and lectures on Latin idiom and style.

615. Proseminar I. Three credit hours. Winter Quarter. General prerequisites must include six Quarters of college Latin. Mr. Titchener.

Lectures on the life and period of Cicero; readings from the Letters and Essays. Latin 615 is designed especially for students preparing to teach Latin.

616. Proseminar II. Three credit hours. Spring Quarter. General prerequisites must include six Quarters of college Latin. Mr. Titchener.

Lectures on the life and works of Vergil, and his influence on modern literature; readings from the Eclogues and the Georgics. Latin 616 is designed especially for students preparing to teach Latin.

617. Proseminar III. Three credit hours. Autumn Quarter. General prerequisites must include six Quarters of college Latin. Mr. Titchener.

† Not given during the academic year, 1954-1955.

Lectures on topics suggested by the study of Caesar's Gallic and Civil Wars; special consideration of literary style, political and military campaigns. Latin 617 is designed especially for students preparing to teach Latin.

627. Vulgar Latin. Three credit hours. Winter Quarter. General prerequisites must include six Quarters of college Latin, French 801, or equivalent linguistic basis. Mr. Abbott.

Lectures and the study of texts and inscriptions illustrating the development of the popular speech.

631. Private Reading and Minor Problems. One to six credit hours. One Quarter. Autumn, Winter, Spring. General prerequisites must include one reading course more advanced than Latin comedy. The staff.

Passages for private reading and topics for investigation will be suggested to meet the needs of individual students.

650-651-652. History of Roman Literature. Three credit hours. Autumn, Winter, and Spring Quarters. General prerequisites must include three reading courses more advanced than Latin comedy. The content of the readings within this course is so extensive that graduate students may repeat this course for credit. Mr. Abbott.

Lectures and assigned reading in literary histories on the development of Roman literature; required and suggested passages for translation in each author studied; brief weekly reports.

701. Special Problems. One to four credit hours. All Quarters. General prerequisites must include ten hours of advanced work in Classical Languages for classical majors; for other majors, permission of the instructor.

Assigned reading and individual research. Registration for this course should be followed by a letter designating the field of study.

- (a) Epigraphy
- (b) Palaeography
- (c) Topography of Rome
- (d) Greek Art and Archaeology
- (e) History of the Latin Language
- (f) History of the Greek Language

Latin 701 c, d, e, f are not open to students who have had Latin 755, 756, 721, and 722, respectively.

702. Plautus and Terence. Three credit hours. Autumn Quarter. General prerequisites must include ten hours of advanced work in the classics. Mr. Abbott.

Aim and accomplishment in Rome's earliest successful literary effort.

703. Horace. Three credit hours. Winter Quarter. General prerequisites must include ten hours of advanced work in the classics. Mr. Titchener.

The practice of literary theory in the poetic essay and the lyric of human philosophy.

704. Tacitus. Three credit hours. Spring Quarter. General prerequisites must include ten hours of advanced work in the classics. Mr. Forbes.

The last great literary exponent of the Greco-Roman theory of the method and value of historical writing.

720. Introduction to Historical Greek and Latin Grammar. Three credit hours. Autumn Quarter. General prerequisites must include ten hours of advanced work in the classics. Mr. Abbott.

The development of the sounds and inflections from Indo-European to Classical Latin, and with an introduction to Comparative Greek and Latin phonetics and morphology.

NOTE: TEACHING COURSE. For the Teaching Course in this department see the Department of Education, Course 694.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

800. Seminar. Three credit hours. Autumn, Winter, and Spring Quarters. Mr. Titchener, Mr. Abbott.

Textual criticism and research problems. The author to be studied will be assigned by the instructor.

950. Research in Classical Languages. Autumn, Winter, and Spring Quarters. The staff.

COMPARATIVE LITERATURE AND LANGUAGE

Courses formerly offered under the above heading will be found under the Departments of Classical Languages and Literature, and German.

DAIRY SCIENCE Office, 304 Plumb Hall

PROFESSORS ELY, SALISBURY, SUTTON, AND GILMORE (WOOSTER), ASSOCIATE PROFESSORS LUDWICK, AND HIBBS (WOOSTER), ASSISTANT PROFESSOR BRAKEL

All work leading to a graduate degree in this department shall be done under the supervision of the graduate committee of the department. This committee shall pass on the candidate's fitness for the work and approve course work and thesis plans before he proceeds.

The areas of specialization for graduate work in the Department of Dairy Science are animal nutrition, animal genetics, and dairy production.

Basic prerequisites for all graduate students in Dairy Science shall include acceptable courses in biology, physiology, mathematics, and agricultural biochemistry. Students interested in animal nutrition should have credit in academic courses in agricultural or biological chemistry equivalent to Agricultural Biochemistry 601 and 609; those interested in animal genetics should have credit in academic courses equivalent to Zoology 403.

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

610. Physiology of Growth and Milk Secretion. Three credit hours. Autumn Quarter. Two lectures and one laboratory period each week. Mr. Ludwick.

Hormone function and its influence on growth and milk secretion. Growth and its relationship to performance. The physiological processes involved in the synthesis and ejection of milk.

612. Physiology of Reproduction and Artificial Insemination. Three credit hours. Spring Quarter. One lecture and two two-hour laboratory periods each week. Mr. Ludwick.

The anatomy and physiology of the reproductive organs of the male and female, and reproduction abnormalities and causes of reproductive inefficiency. History and development of artificial breeding, organization and operation of the service, techniques in collecting, diluting, evaluating, and processing of semen.

615. Dairy Science Extension Methods. Three credit hours. Autumn Quarter. Three two-hour lecture-discussion periods each week. Mr. Salisbury.

Specific examples of dairy farmer needs and how to meet them. Relationship between production, testing, artificial breeding associations, and sire proving.

620. Livestock Genetics. Five credit hours. One Quarter. Autumn, Winter, Spring. Five lectures each week. General prerequisites must include at least five Quarter hours of genetics. Mr. Fechheimer.

Genetic principles as they apply to systems of livestock improvement, growth, and development, milk production, efficiency of feed utilization, type reproductive efficiency, prolificacy, lethals disease resistance, blood antigens, and coat color.

Not open to students who have received credit in Dairy Science 511.

626. Marketing of Dairy Products. Three credit hours. Winter Quarter. Three lectures each week. General prerequisites must include Agricultural Economics 613. Mr. Baumer.

A study of assembling, transporting, and marketing of dairy products, with special reference to Ohio. Attention will be given to changing marketing areas, producer's cooperative movements, and manufacturers' consolidation activities. One or two inspection trips of two or three days each will be made.

701. Special Problems. Two to five credit hours. Autumn, Winter, and Spring Quarters. Written permission of the instructor is required. Offered at Columbus and Wooster. The staff.

Special assignments in the advanced phases of dairy husbandry problems. Students will elect work in desired subjects after conference with the instructor in charge.

714. Research Methods and Techniques. Five credit hours. Autumn Quarter. Three lectures and one four-hour laboratory period each week. General prerequisites must include twenty hours in animal and dairy science courses, and written permission of the instructor in charge. Mr. Gilmore.

A course which surveys and analyzes research work in the fields of Dairy and Animal Husbandry at leading research centers. Experimental procedures in management, nutrition, performance, reproduction, and breeding are examined by the students. Detailed practice is given in abstracting literature and in preparing bibliographies, taking measurements, analyzing experimental data and writing reports.

Not open to students who have credit for Animal Husbandry 614 or 714.

720. Advanced Dairy Cattle Breeding. Five credit hours. Winter Quarter. Three lectures and two two-hour laboratory periods each week. General prerequisites must include Dairy Science 620 or equivalent and permission of the instructor. Mr. Ludwick.

Measures of performance in dairy cattle, useful statistical interpretation, problems in herd analyses and evaluations, and modern sire selection.

Not open to students who have received credit in Dairy Science 611.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

801. Dairy Science Seminar. One to three credit hours. Autumn, Winter, and Spring Quarters. Required of all graduate students in Dairy Science. Offered at Columbus and at Wooster. Mr. Ely.

898. Interdepartmental Seminar in Nutrition and Food Technology. One credit hour. Spring Quarter. In cooperation between the Institute of Nutrition and Food Technology and the several departments interested, a seminar will be conducted in nutrition and in the related field of food technology. Subject and staff will be announced each year after approval by the Graduate School.

950. Research in Dairy Science. Autumn, Winter, and Spring Quarters. Laboratory, library, and conference work. Offered at Columbus and at Wooster. Mr. Ely, Mr. Salisbury, Mr. Sutton, Mr. Hibbs (Wooster), Mr. Gilmore (Wooster), Mr. Ludwick.

Research may be done in animal nutrition, animal breeding, or dairy production.

DAIRY TECHNOLOGY

Office, 122 Agricultural Laboratories Building

PROFESSORS GOULD AND BURGWALD, ASSOCIATE PROFESSOR SLATTER,
ASSISTANT PROFESSORS HARMAN AND HARPER

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

605. Management of Dairy Plants. Five credit hours. Winter Quarter. Five discussion periods each week. General prerequisites must include Dairy Technology 607 and 610. Mr. Gould.

Discussions will deal with plant management problems of dairy processing and manufacturing organizations; operational and business practices; plant efficiencies including waste conservation and disposal and water treatment; record keeping and interpretation; sanitation and good housekeeping; personnel employment and management; sales and distribution.

607. Market Milk. Five credit hours. Winter Quarter. Three discussion periods and two three-hour laboratory periods each week. Bacteriology 610 and 611 must be included in the general prerequisites. Mr. Burgwald.

This course deals with the fluid milk industry, including processing and distribution of milk and cream for city trade. Considerable attention will be given to plant operations and problems pertaining thereto. The laboratory work will consist of the application of bacteriology and chemistry to the production of quality products. Training and practice will be given in milk inspection from the standpoint of the Board of Health and the city milk plant.

609. Concentrated Milk Products. Three credit hours. Spring Quarter. Two discussion periods and one three-hour laboratory period each week. General prerequisites must include courses in bacteriology and dairy chemistry. Mr. Harman.

This is a comprehensive study of condensed, evaporated, and powdered milk and milk products. Chemical and physical properties, manufacturing methods, and utilization of concentrated products are presented in lecture and laboratory. Laboratory time will be devoted to manufacturing practices.

610. Ice Cream Industry. Five credit hours. Autumn Quarter. Three discussion periods and two three-hour laboratory periods each week. General prerequisites must include Dairy Technology 607; prerequisite, Dairy Technology 609. Mr. Harman.

The course deals with the modern ice cream industry. Discussions and laboratory studies will deal principally with the technical aspects of commercial manufacturing methods and quality control. Limited attention will be given to problems of sales and distribution.

620. Cheese Industry. Three credit hours. Autumn Quarter. Three discussion periods each week. General prerequisites must include Dairy Technology 607, Bacteriology 610 and 611. Mr. Slatter.

A study of commercial methods of manufacturing Cheddar, Colby, Swiss, Brick, Cottage, and Cream cheese. Emphasis will be placed on the application of chemistry and bacteriology. Attention will be given to current fundamental research in the cheese field.

621. Cheese Industry. Three credit hours. Autumn Quarter. One seven-hour laboratory period each week. Dairy Technology 620 must be included in the general prerequisites or taken concurrently. Mr. Slatter.

Practical experience will be given in the manufacture of the most common varieties of hard and soft cheese with special reference to physical, chemical, and bacteriological factors affecting quality; propagation and care of starters; and determination of cheese composition.

651. Junior Seminar. One credit hour. Autumn Quarter. One discussion period each week. General prerequisites must include Dairy Technology 607 and senior standing in Dairy Technology. Mr. Harper.

An historical review of research literature in dairy technology with emphasis on the preparation and presentation of technical abstracts and papers. Experience in writing technical papers and in presenting technical subject matter before a critical audience will be given.

Not open for graduate credit for students in Dairy Technology.

652. Junior Seminar. One credit hour. Winter Quarter. One discussion period each week. General prerequisites must include Dairy Technology 651. Mr. Gould.

A continuation of Dairy Technology 651. Emphasis will be placed on current research problems in Dairy Technology. Attention will be given to leading research workers in dairy technology and their contributions. The role of research in the dairy industry will be stressed.

Not open for graduate credit for students in Dairy Technology.

701. Special Problems. Two to five credit hours. Autumn, Winter, and Spring Quarters. One hour conference each week. Staff.

This course is designed for students majoring in dairy technology and consists in working out special problems along the lines in which they are specializing.

710. Technical Control of Dairy Products. Three credit hours. Autumn Quarter. Three discussion periods per week. General prerequisites must include Dairy Technology 607 and 610, Agricultural Biochemistry 603, or graduate standing in Dairy Technology. Mr. Gould.

Attention is given to the application of technical control methods to dairy plant operations and to the interpretation of laboratory findings. Chemical and bacteriological techniques are reviewed with emphasis being placed on their use in solving dairy plant problems.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

800. Seminar. One credit hour. Autumn, Winter, and Spring Quarters. One hour conference each week. Open to graduate students who are majors in Dairy Technology or who have special interest in this field. Students and faculty members will report on problems of special interest. Mr. Gould, Mr. Burgwald, Mr. Slatter, Mr. Harper.

898. Interdepartmental Seminar in Nutrition and Food Technology. One credit hour. Spring Quarter. In cooperation between the Institute of Nutrition and Food Technology and those instructional departments who are interested, a seminar will be conducted in nutrition and in the related field of food technology. Subject and staff to be announced each year after the approval of the Graduate School.

950. Research in Dairy Technology. Autumn, Winter, and Spring Quarters. One hour conference each week. General prerequisites must include at least twenty hours of work in the department, and the consent of the instructor must be obtained. Mr. Gould, Mr. Burgwald, Mr. Slatter, Mr. Harper.

Research may be conducted on projects in the fields of market milk, butter, cheese, ice cream, and concentrated dairy products. The selected problem may apply to dairy plant management or may deal with certain aspects of dairy chemistry, dairy bacteriology, dairy engineering, or nutrition.

DENTISTRY

Office, 128 Dentistry Building

PROFESSORS POSTLE, SNYDER, JONES, KITCHIN, BOUCHER, ROBINSON, AND WILSON, ASSOCIATE PROFESSOR ALLISON, ASSISTANT PROFESSORS WADE, PERMAR AND WILLIAMS

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51. These prerequisites include adequate preparation in technical courses concerned.

620. Oral Histology and Embryology. Three credit hours. Spring Quarter. Two lectures or quizzes and four laboratory hours each week. General prerequisites must include Anatomy 634 and 635. Mr. Kitchin, Miss Permar.

Embryology and histology of teeth and adjacent parts, with special attention to a correlation between minute anatomy and the procedures of dentistry.

Open only to students doubly registered in the College of Dentistry and the Graduate School.

680. Oral Pathology. Three credit hours. Autumn Quarter. Two lectures or quizzes and three laboratory or clinical hours each week. General prerequisites must include Pathology 651 or 653 and Operative Dentistry 620. Mr. Robinson.

The study of pathological lesions within and about the teeth, with clinical demonstrations.

Open only to students doubly registered in the College of Dentistry and the Graduate School.

701-702-703. Minor Problems in Operative Dentistry. One to three credit hours. Autumn, Winter, and Spring Quarters.

Students will have assigned to them special problems in Operative Dentistry.

704-705-706. Minor Problems in Prosthetic Dentistry. One to three credit hours. Autumn, Winter, and Spring Quarters.

Students will have assigned to them special problems in Prosthesis.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

***801. Special Problems in Clinical Oral Surgery and Anesthesia.** One to five credit hours. Repeated in Autumn, Winter, and Spring Quarters for two years. Required of all students majoring in Oral Surgery. Mr. Allison.

The importance of accurate diagnosis and good judgment in bringing the treatment of surgical conditions of the teeth and contiguous structures to a satisfactory conclusion will be stressed. Advanced surgical techniques and practical procedures with special emphasis on the related basic fields of anatomy, physiology, and pathology. Recent advances in local and general anesthesia and their relation to practical procedures will be considered.

802. Special Problems in Clinical Orthodontics. One to five credit hours. Repeated in Autumn, Winter, and Spring Quarters for two years. Required of all students majoring in Orthodontics. Mr. Wade, Mr. Jones, Mr. Williams.

The construction of special appliances. The manipulation of appliances in treatment of dental and associated deformities. Consideration of growth problems in relation to orthodontic procedures.

803. Special Problems in Clinical Periodontics. One to five credit hours. Repeated in Autumn, Winter, and Spring Quarters for two years. Required of all students majoring in Periodontics. Mr. Wilson.

Diagnosis and treatment of Periodontal disease. Emphasis will be placed on correlation between the diseases of the periodontium to probable systematic maladjustments as well as maladjustments of a purely dental nature.

804. Histological Laboratory Technique. One to three credit hours. Autumn and Winter Quarters. Required of all graduate students in Dentistry. Mr. Kitchen, Miss Permar.

The preparation of oral and dental tissues for microscopic study, including tissue fixation, grinding of tooth and bone sections, decalcification of combined hard and soft tissues with subsequent celloidin embedding, paraffin embedding of soft tissues, cutting of embedded material, staining and mounting and study of sections.

805. Seminar in Dentistry. One credit hour. Repeated in Autumn, Winter, and Spring Quarters for two years. One seminar each week. Required of all graduate students in Dentistry. Mr. Kitchen, Mr. Boucher, Mr. Robinson, Miss Premar, Mr. Jones, Mr. Allison, Mr. Williams, Mr. Wade.

The purpose of these seminars is to acquaint those whose interest is specialized with recent advances in all branches of dental science. Instructors and students will participate and subjects will be assigned with reference to the field of the individual's specialization. Review of original literature will form a basis for such discussions. The following topics will be considered: (1) Problems in diagnosis and treatment of surgical conditions of the oral cavity and contiguous structures. (2) Correlation of problems in Periodontics with related sciences. Physiology and Pathology of the bone will be considered. The relation of nutrition to Periodontics will be discussed. (3) A study of special topics related to Orthodontics. (4) Problems in Roentgenographic diagnosis will be discussed, with special emphasis on existing microscopic pathology. (5) Discussion of special topics in the fields of Dental Histology and Embryology.

806. Special Problems in Clinical Prosthetic Dentistry. One to five credit hours. Repeated in Autumn, Winter and Spring Quarters for two years. Required of all students majoring in Prosthesis. Mr. Boucher and staff.

The diagnosis and treatment of lost or congenitally absent parts of the mouth and face by means of prosthetic appliances. The construction of special prosthetic appliances.

807. Special Problems in Oral Pathology and Diagnosis. One to six credit hours. Repeated in Autumn, Winter, Spring, and Summer Quarters for two years. Mr. Robinson.

The interrelationships of gross, microscopic, and clinical pathology will be stressed. Functional, as well as morphologic, changes will be considered with evaluation of their importance in diagnosis of oral disease. Current advances in the field of oral pathology and diagnosis will be discussed. An oral pathology conference will be repeated for one hour each week in the Autumn, Winter and Spring Quarters. Microscopic material from clinical biopsies will be reviewed as received and supplemented by material from the Registry of Oral and Dental Pathology of the Army Pathology Institute and from other sources.

* Not given in 1954-1955.

950. Research. Credits to be arranged. Autumn, Winter, and Spring Quarters.

Original work to supply the basis for a thesis.

DRAWING (See Engineering Drawing)

ECONOMICS Office, 239 Hagerty Hall

PROFESSORS BOWERS, WOLFE (EMERITUS), HAYES (EMERITUS), DICE (EMERITUS), SALZ (EMERITUS), SMART, JAMES, HERBST, PATTON, AND DEWEY, ASSOCIATE PROFESSORS HARRISON, LOVENSTEIN, ARNOLD, MILLER, COONS, CALDERWOOD, TUTTLE, PARNES, AND BICKLEY, ASSISTANT PROFESSORS STEVENS, QUANTIUS, CONDOIDE, BALLEES AND LYNN

Prerequisites for Graduate Work: The undergraduate preparation for students specializing in economics should include in addition to basic courses in economics, elementary courses in at least five of the following subjects: accounting, anthropology, business organization, geography, history, mathematics, philosophy, political science, psychology, and sociology. When undergraduate preparation is inadequate, in the judgment of the committee, courses in economics or related subjects may be required in addition to the ordinary requirements for degrees.

Departmental Committee on Graduate Work: The departmental committee on graduate work has general supervision of the programs of students regularly admitted to the Graduate School, who wish to take advanced degrees in economics. Students should report to the chairman of this committee early in their first Quarter of residence.

MASTER'S DEGREE: The candidate for the Master's degree in economics must meet certain minimum requirements: (1) in the general principles of economics; (2) in the history of economic thought and processes, for which Economics 801-802-803 or its equivalent is necessary; (3) in elementary statistics; (4) an adequate preparation in the field of the thesis satisfactory to the thesis advisers.

Satisfaction of the first three requirements will be determined on the basis of a written examination given in the fourth week of the Quarter in which the degree is to be taken. Students will not be admitted to candidacy until the topics of their theses have been approved by the departmental committee on graduate work.

DOCTOR'S DEGREE: The candidate for the Doctor's Degree in Economics should have a broad and liberal training which will enable him to approach his work in an objective manner and from a broad social point of view rather than from that of a narrow special interest. In order to attain this point of view, he should have gained familiarity with the progress which has been made not only in economics but also in the other social sciences, as well as in philosophy and psychology. A reasonable acquaintance with European and American history is presupposed. The candidate should have an elementary knowledge of calculus, and shall have a knowledge of statistics at least equivalent to Economics 710-711-712. He shall have a dictionary reading knowledge of two modern foreign languages, or a thorough reading knowledge of one modern foreign language. The selection made by the student must be approved by the Committee on Graduate Work.

The more specific requirements for the Doctor's degree in economics include the following:

- (1) The minimum requirements for the Master's degree as given above;
- (2) Concentration in four of the following fields, one of which shall be Economic Theory; the preparation shall cover the entire field without limitation to particular courses:
 - (a) Economic Theory: History of Economic Thought
 - (b) Economic History, American and European
 - (c) Labor Relations; Labor and Government; Social Insurance
 - (d) Money; Credit; Banking; Monetary-fiscal Policy
 - (e) Public Finance
 - (f) International Economic Relations
 - (g) Transportation; Public Utilities; Public Control
 - (h) Economic Statistics; Econometrics
 - (i) Business Fluctuations; National Income Accounting
 - (j) Economic Systems, Planning and Reform; Welfare Economics

NOTES: It is recommended that a field should consist of a minimum of nine credit hours of course work taken at The Ohio State University, or an equivalent in work taken elsewhere, of which at least two hours must consist of course work with an 800 number taken at The Ohio State University.

Courses from allied departments may be counted toward the field requirement when approved by the Department Committee on Graduate Work.

- (3) An additional field consisting of courses which are not closely related to the field of the candidate's dissertation should be selected from other departments with the approval of the candidate's adviser.

The adequacy of preparation in fields (2) and (3) will be tested by written and oral examinations, which must be passed before admission to candidacy. Topics for dissertations must be approved by the departmental committee on graduate work at least two Quarters before the degree may be taken. Detailed statements of the forms of application for examinations and approval of dissertation topics may be obtained from the chairman of the committee on graduate work.

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

601-602-603. Intermediate Economic Analysis. Three credit hours. Three Quarters. 601, Autumn; 602, Winter; 603, Spring. Three class meetings each week. Mr. James.

A review of the scope and nature of economic analysis: competitive and monopolistic markets in the allocation of consumers' goods and inputs of the factors of production; coordination of basic economic processes at different output levels.

606. Current Economic Problems. Three credit hours. Winter Quarter. Three class meetings each week. General prerequisites must include a course in economics.

An examination of current economic problems such as: the maintenance or securing of an optimum level of employment; the conditions underlying consumer expenditures, savings, and investments; problems of inflation and deflation; special problems of agricultural production and prices, public works, housing, and regional development.

Not open to students who have credit for Economics 604-605.

613. Problems of Monetary-Fiscal Policy. Three credit hours. Winter Quarter. Three class meetings each week. General prerequisites must include a course in money and banking or the equivalent. Miss Quantius.

An institutional and theoretical analysis of the monetary and fiscal system. Monetary-fiscal policies for stabilization at high levels of production, employment, and income. Emphasis on contemporary problems of policy.

618. Transportation Economics. Five credit hours. One Quarter Autumn, Winter, Spring. Five class meetings each week. Mr. Dewey.

A general survey of the history and regulation of inland transportation agencies, and a discussion of current problems of transportation and regulation, for students with a general interest in the field of economics as well as for those with a special interest in transportation.

Not open to students who have credit for Economics 692-693.

619. Air Transportation. Three credit hours. Spring Quarter. Three class meetings each week. General prerequisites must include Economics 618. Mr. Dewey.

Historical background and economic aspects of air transportation. Routes and services. Interrelationships of air, railroad, highway, and ocean transportation. Airline operating costs in relation to types of equipment and ground facilities. Economic principles of rate-making. Government control and assistance to airline operations.

620. Highway Transportation. Three credit hours. Winter Quarter. Three class meetings each week. General prerequisites must include Economics 618. Mr. Dewey.

An intensive study of the economic aspects of highway transportation. Governmental promotion and regulation of highway transportation. Highway and motor-carrier costs. Problems of motor-carrier rates, services, taxes, weights and sizes, coordination and consolidation, and relationships with competitive modes of transportation.

624. Principles of Insurance. Three credit hours. One Quarter. Autumn, Winter, Spring. Three class meetings each week. Mr. Bowers, Mr. Bickley, Mr. Lynn.

A study of the theory and practice of the principal types of insurance in the life, fire, and casualty fields. The economic theory of risk; loss prevention; state supervision, etc.

Not open to students who have credit for Business Organization 760, 761, 764 or 765.

627. Analysis and Control of Business Cycles. Three credit hours. Spring Quarter. Mr. Dewey.

A general survey of changes in price levels and production. Past and current theories of business cycles. Proposed plans for control of economic fluctuation.

***628. Evolution of Industrial Capitalism.** Three credit hours. Autumn Quarter. Given in alternate years. Mr. Harrison.

Analysis of the origin and growth of industrial capitalism, basic changes involved in the English Industrial Revolution, the rise of industrial capitalists and business leaders.

629. American Capitalism since the Civil War. Three credit hours. Winter Quarter. Mr. Harrison.

The development of American capitalism, with special emphasis given to the rise of big business and organized labor, the significance of increasing rigidities in the price-income structure and the growing importance of government in economic life.

630. Economic and Business History of Selected American Firms. Three credit hours. Spring Quarter. Mr. Harrison.

Analysis of the development of some outstanding companies in important types of business with regard to such factors as the relation to basic economic trends, innovations affecting conditions of supply and demand, formulation of price policy, and practices and plans with regard to profits.

631. Governmental Expenditures. Three credit hours. Autumn Quarter. Mr. Smart.

Growth of public expenditures. Factors leading to such growth. Classification and control of public expenditures. Public debt.

632. Governmental Revenues. Three credit hours. Winter Quarter. Mr. Smart.

Treatment of various sources of revenues with special emphasis upon taxation. Particular attention will be given to the tax and revenue system of the State of Ohio and its political subdivisions.

633. Governmental Fiscal Administration. Three credit hours. Spring Quarter. General prerequisites must include Economics 631 and 632. Mr. Smart.

Fiscal relationships among Federal, state, and local governments. The growth of grants-in-aid and subsidies. Shared taxes. Fiscal policy.

637. The American Labor Movement. Five credit hours. One Quarter. Autumn and Winter. Five class meetings each week. Miss Herbst, Mr. Miller, Mr. Parnes.

The history and theory of the American labor movement. Evolution of public policy toward collective bargaining. Trade union policies, programs, organization and administration.

Not open to students who have credit for Economics 694-695.

638. Labor and the Government. Three credit hours. Winter Quarter. Three class meetings each week. Miss Herbst, Mr. Miller, Mr. Parnes.

The role of the legislative, judicial, and executive branches of government with respect to labor problems and labor relations. State and federal protective legislation. State and federal regulation of labor-management relations.

639. Social Insurance. Three credit hours. One Quarter. Autumn and Spring. Mr. Bowers.

A study of the theories and operations of social insurance systems as devices for providing security against the hazards of unemployment, disability, dependent old age and premature death. Among the topics covered are, unemployment compensation and wage guarantees, workmen's compensation insurance, non-occupational disability insurance and old age and survivors insurance.

640. Foreign Labor Movements. Three credit hours. Spring Quarter. Three class meetings each week. Miss Herbst.

The history and development of labor movements in selected countries. The political, legal, economic and social foundations of industrial relations in these countries. The international labor movement.

645. Consumption Economics. Three credit hours. Winter Quarter. Three class meetings each week. Mr. Coons.

* Not given in 1954-1955.

The economics of consumption from the standpoint of the individual and of society; wealth and income in relation to consumption; price levels and cost of living; standards and levels of living; consumer budgets; influences determining consumer choice; the consumer movement, including consumer cooperatives; government aid and protection to the consumer.

648. Public Utility Economics. Five credit hours. One Quarter. Autumn and Spring. Five class meetings each week. Mr. Dewey.

A course complementary to Economics 618, with special emphasis on local public utilities, including water, gas, electric light and power, telephone and telegraph, etc. The history and present status of regulation and the leading problems arising therefrom, including supervision of holding companies, valuation, reasonableness of rates, adequacy and economy of service, etc. Public ownership versus public regulation.

650. The Labor Market. Three credit hours. Spring Quarter. General prerequisites must include Economics 637 or 641. Mr. Parnes.

Materials and methods of labor market analysis. The labor marketing process in its institutional setting. Composition of the labor force. Recent research in labor mobility. Workers' labor market behavior and the labor allocation process.

652. Economics of Socialism. Three credit hours. Winter Quarter. Three class meetings each week. General prerequisites must include a course in economics. Mr. Lovenstein.

A survey of socialist thought including the Utopians, Marxism, syndicalism, and other socialist movements. The theory and practice of socialist economics; allocation, planning, price mechanism, and controls.

Not open to students who have credit for Economics 669 or 671.

654. Soviet Economic System. Three credit hours. Autumn Quarter. Three class meetings each week. General prerequisites must include a course in economics. Mr. Condoide.

The theory and practice of Soviet economics, with major emphasis on economic planning; allocation of factors of production; spending, saving, and investing; money and credit; public finance; international trade and finance; and agriculture.

Not open to students who have credit for Economics 525.

656. National Income Analysis. Three credit hours. Autumn Quarter. Three class meetings each week. General prerequisites must include a course in economics and a course in statistics. Mr. Coons.

A study of the technique, sources of information, and methods of testing and verification involved in Social Accounting; analysis of procedures used by the Department of Commerce in its estimates of Gross National Product and National Income.

660. Population. Three credit hours. Spring Quarter. Three class meetings each week. Mr. Harrison.

The growth and distribution of population. The relation of numbers to resources, productive capacity, standard of living, prosperity, and international economic problems. The dynamic aspects of population in relation to material and moral progress. Critical consideration of population theories and policies.

664-665-666. International Trade and Finance. Three credit hours. Three Quarters. 664, Autumn; 665, Winter; 666, Spring. Mr. James, Mr. Calderwood.

Theories of international trade; The United States and major industrial countries as related to the world economy in terms of their balance of payments; international economic policy; types of trade restrictions; new organizations for stabilization of international trade and finance.

673. Principles of Social Economy. Three credit hours. Autumn Quarter. Three class meetings each week. Mr. Patton.

The intent of this course is to arrive at some insight into the meaning and criteria of ideal economy, not in its material and technological, but in its fundamental human aspects. Purposive economics in relation to fundamental human values. Fundamental values and instrumental values. The means-end relation and the principle of economy of means. Income as opportunity, and the economic criteria of distribution of opportunity. The conflict between efficiency, liberty, and the ideal use of resources, material and human. Democracy and authoritarianism in relation to economy. An economic interpretation of social conflict and social ethics.

674. Design of Statistical Inquiry in Social Sciences. Two credit hours. One Quarter. Autumn, Winter, Spring. General prerequisites must include a course in statistics or the equivalent and thirty credit hours in social science, and permission of the instructor. Mr. Arnold.

Studies of deductive and inductive methods of analyzing socio-economic and business problems. Statistical schedule design, interdependence of cases, questionnaires, codes, skeleton tables, and methods of tabulation (including electrical punchboard). Need for and means of obtaining statistical comparability from sample data. Problems involved in the use of sample data for measuring trends. Preparing the report.

Not open to students who have credit for Economics 527.

675. Mathematical Economic Theory. Three credit hours. Summer or Autumn Quarter (alternating between Summer Quarter of even-numbered and Autumn Quarter of odd-numbered years). General prerequisites must include a course in economics, a standard course in college algebra, and permission of the instructor. A knowledge of differential calculus is desirable. Mr. Tuttle.

Application of the essentials of differential calculus in deriving the principal theories of economic marginal analysis. Illustrative problems and examples.

679. Economic Problems of Western Europe. Three credit hours. Winter Quarter. Three class meetings each week. General prerequisites must include a course in economics. Mr. Calderwood.

The role of Western Europe in the world economy. The effects of World War II and problems of reconstruction and of east-west trade. Programs for European integration and the work of international economic agencies.

681. Collective Bargaining. Two credit hours. Autumn Quarter. One class meeting each week. General prerequisites must include Economics 637 or the equivalent and permission of the instructor. Miss Herbst.

Economic and legal aspects of collective bargaining. Techniques and procedures used. Major issues and problems of collective bargaining.

682. Mediation and Arbitration. Two credit hours. Spring Quarter. One class meeting each week. General prerequisites must include Economics 637 or the equivalent and permission of the instructor. Miss Herbst.

The handling and settlement of industrial disputes. The role of the federal, state and local government in adjusting disputes. The activities of private organizations and individuals in mediation and arbitration. Techniques and procedures in mediation and arbitration.

690. Contemporary Economic Systems. Three credit hours. Wright Field Graduate Center only. Mr. Lovenstein.

Comparative study of the development and operation of principal economic institutions in capitalist, socialist, communist, and fascist economic systems. Special attention will be given to the economy of Soviet Russia and its satellites, to Socialist experience in Great Britain, and to the economic organization of other countries which are of military importance to the United States.

691. Economics of National Security. Three credit hours. Wright Field Graduate Center only. Mr. Lovenstein.

An analysis of the economic problems arising out of war mobilization. Emphasis is placed upon fundamental economic relationships and the impact upon such relationships in a time of emergency controls. Attention is given to problems of military procurement, labor-management relations, allocation of materials and manpower, price and wage controls, problems peculiar to business, labor, and farm groups, etc.

692-693. Transportation Economics. Three credit hours. Wright Field Graduate Center only. Two Quarters. 692 is a prerequisite to 693. Mr. Ruggles.

The first course (692) is a general survey of the history and regulation of inland transportation agencies and a discussion of current problems of transportation and regulation. The second course (693) is concerned with such current questions as the coordination of the various transportation services and terminal problems, with emphasis on port terminals. Both courses are for students with a general interest in the field of Economics as well as for those with a special interest in transportation.

Not open to students who have credit for Economics 618.

694-695. Labor Relations. Three credit hours. Wright Field Graduate Center only. Two Quarters. 694 is prerequisite to 695. Mr. Miller.

The first course (694) is a survey of the history of the labor movement; unionism, reform movements and political activity during the growth of the United States; types of unionism, theories, policies, methods, and practices; leadership in trade unions. The second course (695)

deals with the current situation, with particular reference to the legal status of unions, collective bargaining, strikes, and lockouts; political activities of organized labor; methods of preventing or settling labor disputes; government regulation affecting the labor movement.

Not open to students who have credit for Economics 637.

703-704. Statistical Analysis. Three credit hours. Wright Field Graduate Center only. Two Quarters. 703 is a prerequisite to 704. General prerequisites must include four credit hours of statistics and permission of the instructor. Mr. Smart.

The first course (703) will cover briefly the history of Statistics and presentation of statistical material. The major part of the course will be concerned with the analysis of frequency distributions. The second course (704) will be spent largely on correlation analysis, both simple and multiple. Consideration will be given to sampling and the analysis of variance.

Not open to students who have credit for Economics 710-711-712.

710-711-712. Statistical Analysis. Two credit hours. Three Quarters. 710, Autumn; 711, Winter; 712, Spring. General prerequisites must include four credit hours of statistics and permission of the instructor. Mr. Smart.

Analysis of frequency distributions, correlation and the analysis of variance. Sampling, the design of statistical inquiries and tests of significance as well as the control of the quality of product from the statistical point of view will be emphasized. The use of tabulating and mechanical equipment in handling statistical problems will be treated.

Not open to students who have credit for Economics 703-704.

719. Public Control of Economic Processes. Three credit hours. Spring Quarter. Three class meetings each week. General prerequisites must include Political Science 618 or the equivalent, and permission of the instructor. Mr. Dewey.

Economic and legal foundations of governmental regulation as applied to evolving business institutions in the United States; the economic interpretation of constitutional authority as modified by common law precedent and implemented by statutory enactments; applications to specific problems.

Not open to students who have credit for Economics 716, 717, and 718.

799. Special Problems in Economics. One to three credit hours each Quarter in any one field. For graduate students, not more than three credit hours may be received in any one field nor a total of more than twelve hours in the course. Any Quarter. General prerequisites must include satisfactory advanced courses in economics and related fields. Senior staff.

Individual study in some field of economic interest under the direction of the appropriate member of the staff.

- (a) Economic Theory: History of Economic Thought
- (b) Economic History, American and European
- (c) Labor Relations; Labor and Government; Social Insurance
- (d) Money; Credit; Banking; Monetary-Fiscal Policy
- (e) Public Finance
- (f) International Economic Relations.
- (g) Transportation; Public Utilities; Public Control
- (h) Economic Statistics; Econometrics
- (i) Business Fluctuations; National Income Auditing
- (j) Economic Systems; Planning and Reform; Welfare Economics

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

These prerequisites must include good foundation courses of collegiate grade in the principles of economics, political science, psychology, European and American history.

800. Research Methods in Economics. Two credit hours. One Quarter. Autumn, Winter, Spring. One two-hour class meeting each week. Mr. Bowers, Mr. Dewey, Mr. Arnold and others.

This course is designed to aid the graduate student to evaluate statistical data and other information; methods of analysis used in economic research; choice of research topics and evaluation of results obtained. All new graduate students in Economics are required to take this course during their first or second Quarter in the Graduate School.

801-802-803. History of Economic Thought. Three credit hours. Three Quarters. 801, Autumn; 802, Winter; 803, Spring. Three class meetings each week. Mr. Patton.

The early development of economic ideas in the Western World; Mercantilism and Cameralism; Physiocratic doctrines (801). The economic analysis of the classical school (802). Later classicism and deviations from classical economic doctrine; socialistic doctrines; the historical school; other unorthodoxies (803).

804-805-806. Economic History of the United States. Three credit hours. Three Quarters. 804, Autumn; 805, Winter; 806, Spring. Three class meetings each week. Alternates with Economics 812-813-814. Mr. Smart.

***812-*813-*814. The Economic History of Western Europe.** Two credit hours. Three Quarters. 812, Autumn; 813, Winter; 814, Spring. Two class meetings each week. Preferably preceded or accompanied by Economics 801-802-803. Alternates with Economics 804-805-806. Mr. Smart.

A general survey from the fall of the Roman Empire to the Great War. Especial attention is given to the interrelations between the economic institutions, the general culture, and the economic thought of the various periods. The development of modern capitalism. Economic background and social consequences of the Industrial Revolution. The economic causes and implications of modern European nationalism.

816-817-818. Modern Economic Theories and Analysis. Three credit hours. Three Quarters. 816, Autumn, Mr. Dewey; 817, Winter, Mr. Patton; 818, Spring, Mr. James. Three class meetings each week.

The economic analysis of the neo-classical school (816). Historical, institutional, and collectivistic economic analysis (817). Theories of imperfect competition, economic fluctuations, and economic development (818).

825. Current Taxation Problems. Two credit hours. Winter Quarter. Mr. Smart.

A critical analysis of the taxation problems now before the federal, state, and local governments.

834. Seminar in Transportation and Public Utility Economics. Two credit hours. Winter Quarter. Alternates with Business Organization 845. General prerequisites must include Economics 618. Mr. Dewey.

An analysis of the leading economic problems involved in Government promotion and regulation of transportation and other public utilities; appraisal of existing and alternative systems of regulating public utilities.

838. International Economic Problems. Two credit hours. Spring Quarter. One class meeting each week. Given in alternate years. General prerequisites must include Economics 664-665-666. Mr. James.

A seminar in the analytical problems, theoretical and applied, of international economic adjustments; the development of techniques for implementation of policies.

***843. Problems of the Labor Movement.** Two credit hours. Spring Quarter. General prerequisites must include Economics 637 and 638 or equivalent and permission of the instructor. Alternates with Economics 874. Miss Herbst.

Major problems in present-day trade unionism. A critical analysis of the impact of the labor movement upon the economy.

844. Seminar in Business Fluctuations and National Income Accounting. Two credit hours. Spring Quarter. Given in alternate years. Mr. Coons.

Analysis of current business cycle theory and national income accounting; evaluation of statistical measures of these phenomena; consideration and appraisal of recent literature in the field.

848. Seminar in Econometrics. Two credit hours. Autumn Quarter. Given in alternate years. General prerequisites must include courses in differential and integral calculus, and permission of the instructor. Mr. Tuttle.

An examination of economic problems whose solutions may advantageously be sought by the use of the methods of mathematics and mathematical statistics.

***849. Seminar in Economic Statistics.** Two credit hours. Autumn Quarter.

* Not given in 1954-1955.

ter. Alternates with 848. General prerequisites must include twelve credit hours in Economics and Business Statistics and permission of the instructor. Mr. Smart.

Recent developments in statistical methods, particularly sampling, and their application to economic and business problems.

863. Advanced Money. Three credit hours. Winter Quarter. Preferably preceded by a course in money and banking. Mr. Balles.

A study of the gold standard; the gold exchange standard; the role of money in the economic organization; the leading types of monetary theory; and the methods of stabilizing the price level.

864. Advanced Banking. Three credit hours. Spring Quarter. Three discussion periods each week. General prerequisites must include a course in money and banking. Mr. Balles.

The integration of the financial institutions; the theories of bank deposits; the theories of the elasticity of bank currency; the discount policy and the interest rate of central banks; the effectiveness of the different methods of regulating credit and business activities.

874. Wage Determination. Two credit hours. Spring Quarter. General prerequisites must include Economics 637 and 638 or equivalent and permission of the instructor. Alternates with Economics 843. Miss Herbst.

A seminar designed to analyze the economics of wage determination. Wage practices and wage theories. Difference in wages as between industries, establishments, geographical areas, occupations, and individual workers.

877. Social Insurance Problems. Two credit hours. Winter Quarter. Mr. Bowers.

A seminar in the analytical problems, theoretical and applied, of State and Federal social insurance programs. Emphasis is placed upon the economic aspects of providing security against the hazards of unemployment, disability, dependant old age and premature death.

888-889-890. Current Economic Literature. One credit hour. Autumn, Winter, and Spring Quarters. Mr. Salz.

A seminar course surveying and analyzing the contributions of the technical journals during the year. Reading assignments according to the student's interest and field of specialization, conferences, reports, and criticisms. Current literature in foreign language may be included, provided preliminary approval of the student's language competence has been given by the instructor in charge.

891. Seminar in Economic Planning. Two credit hours. Spring Quarter.

Analysis of experience in and of theoretical problems in economic planning.

892. Philosophical Foundations of Economics. Three credit hours. Spring Quarter. Fundamental assumptions that give rise to variations in economic thought. The problem of values. The interrelationships of various social sciences. The relationship of social to natural sciences. The problem of verification in economics.

899. Interdepartmental Seminar. One to five credit hours. All Quarters. When two or more departments desire to establish an interdepartmental seminar on a subject of common interest, the chairmen or authorized representatives of the departments concerned shall prepare a course description including the names of faculty members designated to conduct the seminar. The statement shall be submitted to the Executive Committee of the Graduate School for prior approval.

950. Research in Economics. Autumn, Winter, and Spring Quarters. Open by permission of the Committee on Graduate Work.

Qualified graduate students who wish to do research with the advice of members of the staff of the Department of Economics may register for this course.

EDUCATION

Office, 120 Arps Hall

PROFESSORS FAWCETT, ALBERTY, ANDERSON, BURR, CAHOON, CAMPBELL, EBERHART, EIKENBERRY, GOOD (EMERITUS), GRIFFIN, HANNA, HARDING, HECK, HULLFISH, LANDSITTEL (EMERITUS), LEWIS (EMERITUS), MENDENHALL, REEDER, RICHARDSON, SEELY, SMITH (EMERITUS), STONE (EMERITUS), STREITZ, THARP, WARNER, AND ZIRBES (EMERITUS), ASSOCIATE PROFESSORS JEWETT, KIRCHER, LAZAR, AND WELLS, ASSISTANT PROFESSORS BRANDON, DICKSON, HAWS, LAUGHLIN, LOGAN, SUTTON, AND WILLIAMS

Departmental Committee on Graduate Work: A committee, including the Chairman of the department, is in charge of the graduate work of the Department.

Prerequisites for Graduate Work: 1. A student seeking to enter upon graduate work in the field of education shall hold a Bachelor's degree from an accredited institution of higher learning, and, (by official records or comprehensive examinations) shall show familiarity with certain areas of education to the extent that is required for appropriate standard certification to teach in the public schools of Ohio or another state having comparable standards. The areas in which familiarity should be exhibited ordinarily shall include the following: (a) Philosophy or Principles of Education; (b) History of Education; (c) Educational Psychology; (d) Methods of Teaching; (e) School Organization and Management. This does not necessarily mean that courses shall have been taken which bear titles corresponding exactly to the fields named above. In addition to the above requirement the student will present course credits for student teaching or provide evidence of one or more years of successful teaching experience.

2. Specific requirements to supplement the foregoing general prerequisites may be set in the various areas of specialization within the Department.

3. In cases which are exceptional by reason of the maturity, training, and experience of the student concerned, these prerequisites may be modified by the department, subject in each case, to the approval of the Dean of the Graduate School.

Areas of Specialization Within the Department: The following are the areas in which students may specialize for the degrees of Master of Arts or Doctor of Philosophy:

1. *For the Master's Degree:* Elementary education, secondary education, teaching one or more of the secondary school fields, the core program educational administration, philosophy of education, industrial arts, industrial vocational education, history of education, and/or comparative education, special education, guidance and personnel, adult education, and business education.

2. *For the Ph.D. Degree:* Each of the areas named above and in addition, higher education, college teaching of education, evaluation, and the curriculum.

The departmental committee on graduate work, in cooperation with advisory committees, may arrange in specific cases, on either the Master's or Doctor's level, for specializations not listed above, subject to the approval of the Dean of the Graduate School in each instance.

Requirements for the Master's Degree: 1. *Course Requirements.* The minimum forty-five hours of graduate work for the degree must be selected in accordance with certain regulations of the Department. Copies of these regulations may be obtained at the departmental office.

2. *Requirement in Written English.* Each candidate is required to demonstrate ability to write clear and correct English.

3. *Examination Requirements.* Each candidate must take: (a) a written examination in his area of specialization, to be conducted by his adviser and at least one other member nominated by his adviser and approved by the committee on graduate work in education; (b) an oral defense of his thesis before a committee consisting of his adviser and at least one other staff member nominated by his adviser and approved by the department committee on graduate work.

4. *Bases of Recommendation for the Degree.* In making its recommendation concerning the granting of the Master's degree to any student, the examining committee considers his record in course work, his showing on examination, the reports of professors in whose classes he has been enrolled, the quality of his thesis, and any other available data. The Department reserves the right to withhold recommendation for the degree in cases involving moral delinquency, serious mental or emotional instability, active communicable disease of a serious character, or any other physical or mental condition which would render clearly undesirable the student's attempting to enter professional educational work.

Requirements for the Ph.D. Degree: 1. *Direction of the student's work for the doctorate.* At the beginning of a student's work for the doctorate a member of the staff is designated by the committee on graduate work in education as his tentative or temporary adviser. On nomination of the tentative adviser, an advisory committee for the student, consisting of a chairman and at least two other staff members, is appointed. It has the general direction of the student's work.

2. *The foreign-language requirement.* The student's advisory committee designates the method by which the student will meet the foreign language requirement.

3. *The departmental preliminary and the general examinations.* The departmental examination is conducted by the student's advisory committee. It consists of a written portion to be followed at the option of the committee, by an oral portion. The written portion covers the areas designated by the advisory committee. The examination may be taken in any Quarter the student desires, providing that his advisory committee certifies that in its opinion he is prepared to take it. A "satisfactory" report on the examination indicates that in the opinion of the committee the student is prepared to take the general examination for admission to candidacy (provided also that he has satisfied the foreign language requirement of the Graduate School).

The general examination for admission to candidacy consists of a written and oral portion. The written portion covers the area or areas designated by the student's Advisory committee, and requires from six to ten hours. The examination may be taken during any Quarter the student desires, provided he is registered in the Graduate School, has satisfied the foreign language requirement, and has passed the departmental preliminary examination. The general examination is conducted by a committee appointed by the Dean of the Graduate School on nomination of the student's advisory committee. The examining committee ordinarily includes the members of the student's advisory committee.

The areas to be covered by the departmental preliminary and the general examinations and the weight to be given to each area are designated by the student's advisory committee. Not fewer than three nor more than six areas are designated for the two examinations. Of the areas designated, no fewer than three, including those covered in the general examination, are chosen from the areas listed above as suitable for specialization for the doctorate; the others may be within or without the Department of Education. The total number of hours of written examination is not less than twenty. No area designated is given a weight of more than fifty per cent of the total of the two examinations.

In deciding whether a student is to be recommended for admission to candidacy, the committee considers the same types of evidence as for recommendation for the Master's degree. The Department reserves the right to withhold recommendation for admission to candidacy (or for the degree) for the reasons mentioned above in connection with the Master's degree.

4. *Requirement in written English.* Each candidate is required to demonstrate ability to write clear and correct English.

5. *The dissertation.* The dissertation topic is selected by the student with the approval of the student's advisory committee. The members of this committee ordinarily constitute the committee appointed by the Dean of the Graduate School to evaluate the dissertation.

6. *The final oral examination.* The members of the committee to conduct the final oral examination are nominated to the Dean of the Graduate School by the student's advisory committee; ordinarily, this committee includes the members of the advisory committee.

INDEX OF EDUCATION COURSES IN NUMERICAL SEQUENCE

<i>Course Number</i>	<i>Page</i>	<i>Course Number</i>	<i>Page</i>
600	148	751-752	147
601-602	144	753	146
607-642	149	754-756	147
645-648	152	757	149
649	153	758-760	150
654	145	761-762	156
655	163	763	146
656-657	145	764-766	160
659-660	156	768	147
661	145	770-771	161
666-667	160	772-773	160
668	158	774	161
669	154	775-778	150
670-674	155	780-781	162
675	159	782	163
676	153	791	143
677-678	158	798	164
679	163	799	165
680-681	157		
682	164	800	159
683	157	802-804	151
684	159	809	150
685	157	810	151
689	156	812	148
690-694	155	820	160
695	165	824-826	146
699	153	829-832	154
		834	165
703	153	835	151
704	145	836	143
705	153	840	157
706	158	841-844	154
707-708	153	845-852	148
709	154	853	143
714-716	163	856	163
717	164	859	151
722-723	161	860-866	164
724-726	162	871-872	143
727	142	873-880	144
728	162	898	161
729-744	142	899	159
747-748	145		
749-750	146	950	152

AREAS

Educational Administration	142	Teaching of Science.....	157
Elementary Education	144	Teaching of Social Studies.....	158
Guidance	146	Teaching of Speech	158
Higher Education and Teacher Training.....	147	Seminars	159
Minor Problems	148	Special and Adult Education	
Philosophy and History of Education.....	149	Special Education	159
Research	151	Adult Education	161
School Library Science	152	Vocational and Practical Arts Education	
Secondary Education		Business Education	161
General Field	153	Distributive Education	162
Teaching of English	154	Industrial Arts Education.....	163
Teaching of Foreign Languages.....	155	Trade and Industrial Education.....	164
Teaching of Mathematics.....	156	Workshops and Field Experience.....	164
Teaching of Nursing	157		

EDUCATIONAL ADMINISTRATION

FOR ADVANCED UNDERGRADUATES AND GRADUATES

700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

709. Administration of the Secondary Schools. For description, see page 154 under Secondary Education.

727. Introduction to School Administration. Three credit hours. Autumn and Spring Quarters. Required of graduate students preparing for school executive positions. Mr. Reeder, Mr. Campbell.

Designed to give an overview of the organization and administration of education in the United States. The following topics, among others, are discussed: federal, state, and local administration; the philosophies of school administration; finance and business management; the plant; the teaching corps; the pupils; the materials of instruction; records and reports; public relations.

729. Administrative Problems of Rural and Village Superintendents. Three credit hours. Autumn Quarter. Three lectures each week. Assigned readings, investigations and reports. General prerequisites must include Education 727 or its equivalent. Mr. Harris.

Growth of consolidation; relationships with community interests such as church, lodge, and social service groups, relationships with local boards and county and state officials; problems of health, attendance; handicapped pupils; textbooks, supplies, pupil transportation; janitors; 4-H; FFA Clubs and other curricular and co-curricular activities; housing of teachers; supervision; teaching loads; scheduling.

†731. Administration of Physical and Health Education. Three credit hours. Assigned readings and reports. General prerequisites must include Education 727. Not open to students with Physical Education as a major.

The study of the responsibility of administrators for the direction and supervision of health and physical education; organization, management and financing of programs; methods of securing and advising health and physical education staff; duties and services of these special officers; relations to public health; medical inspection; preventive programs; promotional programs; relations to mental health and hygiene; management and financing of athletics.

742. Legal Aspects of School Administration. Three credit hours. Spring Quarter. Three lectures each week. Assigned readings, investigations and reports. General prerequisites must include Education 727 or its equivalent. Mr. Campbell.

A study of the statutes and judicial decisions of the various states relating to education. Major topics: authority and responsibility of teachers; rights, privileges, and responsibilities of students; teachers' contracts and pensions; legal and illegal use of school property; contractual capacity and liability of public school officials; school boundaries and districts; taxation; legal aspects of the curriculum; and expenditures of school money.

***744. Administration of School Retirement and Pension Systems.** One credit hour.

A general introductory treatment of the problems involved in creating and maintaining an adequate retirement system for the school employees of the state.

† Not given during the academic year, 1954-1955.

* Not given in 1954-1955.

791. Internship in Educational Administration. Section (a), four credit hours; section (b), eight credit hours. Autumn, Winter, and Spring Quarters. Students may register for 791 more than once and secure as much as 15 hours credit. Open to graduate students preparing to become principals, superintendents, or other administrative or supervisory officers.

(a) Beginning internship—the student is expected to spend 15 hours each week for one Quarter in a selected public school system and two hours each week in a seminar on campus.

(b) Advanced internship—the student is expected to spend full time for one to three Quarters in a selected public school system (employed at a subsistence rate) and to arrange periodic campus consultation.

Admission by arrangement with the instructor. Mr. Campbell and others.

Provides an opportunity under joint sponsorship of the University and a public school system for the intern to observe school operation, to perform a variety of administrative functions under competent supervision, and to relate theory and practice in educational administration.

FOR GRADUATES

800 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51, also on page 140.

820. The Education of Exceptional Children. For description, see page 160 under Special and Adult Education.

825. Elementary School Administration and Supervision. For description, see page 146 under Secondary Education.

829. Supervision in the Secondary Schools. For description, see page 154 under Secondary Education.

†836. School Surveys. Three credit hours. Winter Quarter. Mr. Campbell.

A study of the literature and methods of school surveys, as a basis for the investigation of practical problems in school administration and supervision.

844. Administrative Problems of the High School Principal. For description, see page 154 under Secondary Education.

853. Public School Relations. Two credit hours. Autumn Quarter. General prerequisites must include Education 727 or its equivalent. Mr. Reeder.

Emphasis on the function of public relations in school administration and the means for securing desirable public relations; the following topics among others are discussed: the aims and criteria for desirable public relations; the superintendent and the board of education in the public-relations program; school publications; American Education Week, commencement, and other special events; organizing and conducting publicity campaigns; and public opinion of education and its measurement.

Not open to students who have credit for Education 740.

871. Administrative Problems of the City Superintendent. Two credit hours. Spring Quarter. General prerequisites must include Education 727 or the equivalent. Mr. Campbell.

Social and legal status of superintendent; his civic and economic relationships to other agencies of the community; city planning; labor unions; pressure groups; state and federal relationships; problems in nutrition and special care of pupils.

872. Administration of Pupil Personnel. Three credit hours. Spring Quarter. Three lectures each week. Assigned readings, investigations and reports. General prerequisites must include Education 727 or its equivalent. Mr. Heck.

Compulsory education laws and working certificates in Ohio and in other states; census information; school record systems; reporting systems; age-grade-progress studies; elimination, grading, and promotion; visiting teacher, clinical services; marking systems.

Not open to students who have credit for Education 738 or 767.

† Not given during the academic year, 1954-1955.

873. Staff Personnel Administration. Three credit hours. Autumn Quarter. General prerequisites must include Education 727 or the equivalent. Mr. Campbell.

Definitions; rise of industry, government and education; philosophy of; man analysis and job analysis; selection; interviewing; in-service training; appraisal; supervision; absenteeism; marital condition; promotion; contracts; certification, dismissal, health and recreation; ethics, morale; public and professional relations; pensions; tenure; salary schedules and other factors of economic and professional welfare.

875. School Finance. Three credit hours. Autumn Quarter. Three lectures each week. Assigned readings, investigations and reports. General prerequisites must include Education 727 or the equivalent. Mr. Reeder.

The literature and sources of data; trends of school costs; outlook for future costs; possible school economies; school expenditures vs. ability to expend; sources of school revenues; meeting a financial stringency; the equalization of educational opportunity; the control of school funds; school indebtedness.

876. Business Administration of Schools. Two credit hours. Winter Quarter. Three lectures each week. Assigned readings, investigations and reports. General prerequisites must include Education 727 or its equivalent. Mr. Reeder.

Function of business administration in the schools; administrative relationships; personnel of the business department; making the budget; procuring revenue; financial accounting; financing capital outlays; janitorial service; school insurance; taking the inventory; supplies; payroll procedure; pupil transportation.

Not open to students who have credit for Education 735.

878. Inter-Governmental Relations in Education. Two credit hours. Autumn Quarter. Two lectures each week. Assigned readings, investigations and reports. General prerequisites must include Education 727 or the equivalent. Mr. Campbell.

Educational activities of the Federal government, past and present; relations to states, territories, and dependencies; principles governing these relationships. Responsibility of the state; various ways typical states meet this responsibility; relations to local authorities; functions at various levels; organizational structures.

880. School Plant Planning. Three credit hours. Winter Quarter. Assigned readings, observation trips, reports. General prerequisites must include Education 727 or the equivalent. Mr. Herrick.

Major problems and techniques in determining the school building needs of a community, in evaluating existing school plant facilities, in planning a new building or remodeling or enlarging an existing building, and in securing and using the services of architects and other specialists; related legal and financial aspects.

NOTE: For additional courses in the Educational Administration area see Psychology 680, Educational Tests and Measurements; Physical Education 683, Organization and Administration of Physical Education; Education 717, Survey of Vocational Education.

ELEMENTARY EDUCATION

FOR ADVANCED UNDERGRADUATES AND GRADUATES

*600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

601. Radio and Television in Education. Three credit hours. Autumn Quarter. Mr. Tyler.

The role of radio and television in the education of both adults and children, in and out of school. Educational objectives in broadcasting, and the planning, production, utilization and evaluation of programs will be considered. Opportunities for observation and individual problems.

602. Audio-Visual Materials of Instruction. Three credit hours. One Quarter. Autumn, Winter, Spring. Mr. Dale, Mr. Woelfel.

The contribution of audi-visual materials to educational objectives, with especial attention to the research literature; principles governing selection and use of films, records, slides and the like.

649. Practicum in Problems of Public Education. For description see page 153 under Secondary Education (General Field).

654. Mathematics in Elementary Education. Three credit hours. Winter Quarter. Mr. Harding.

A study of the development and educative functions of arithmetic and other branches of mathematics in the elementary school. Considers the influence of scientific studies upon the several theories of teaching, the principles upon which they are based, the selection and arrangements of material, development of courses of study, and the improvement of current educational practice. The emphasis throughout is upon the development of mathematical thinking.

Not open to students who are pursuing the curriculum for elementary teachers except by special permission of the departmental adviser.

655. Industrial Arts in Elementary Schools. For description see page 163 under Industrial Arts Education.

656. Language and Reading in the Elementary School. Three credit hours. Spring Quarter. Mr. Dickson.

A consideration of modern trends in the teaching of reading, study habits, oral language, composition, writing, and spelling involving a study of the practical bearings of investigation and progressive theory on the improvement of current practice in the teaching of all phases of English in the elementary school. The organization and administration of functional language arts program.

Not open to students who are pursuing the curriculum for elementary teachers except by special permission of the departmental adviser.

657. Teaching the Social Studies in the Elementary School. Three credit hours. Autumn Quarter. Mr. Burr.

This course considers the educational values of the social studies, reasons for, and ways and means of integrating history, geography, and civics, and the development of pupils of appropriate emotional and thought reactions to social problems and issues. Opportunity is afforded for observation in the University Elementary School.

Not open to students who are pursuing the curriculum for elementary teachers except by special permission of the departmental adviser.

661. Guidance Problems in the Elementary School. Two or three credit hours. Winter Quarter. Mr. Dickson.

Emphasizes problems which the elementary school teacher faces in providing individual, small-group, and whole-group guidance. Problems within the areas of planning with children, modern practices in discipline, evaluating with children, carrying on group work, keeping records, reporting to parents will be considered. Students will choose one problem for major concentration, preparing a comprehensive written report.

704. Laboratory Study of the Ohio State University School. Two to five credit hours. Autumn, Winter, and Spring Quarters. Mr. Klohr.

A graduate course in which elementary and secondary school teachers, principals, supervisors, and superintendents will study the University School in action with the advantages of planned guidance and interpretation, contacts, and conferences with the staff. In addition to the general problems of the course there will be opportunities for students to select individual topics for special study, and to consider the bearings of educational transition on their own work in the field.

747. Foundations of Elementary Education. Three credit hours. Autumn Quarter. Miss Streitz.

Utilization of research in the basic sciences in developing the background for an understanding of present trends in elementary education. Critical examination of current theories. Consideration of dynamic child purposes, pupil-teacher planning, and cooperation between home, school, and community.

Not open to students who have credit for Education 651.

748. The Changing American Elementary School. Three credit hours. Winter Quarter. Mr. Burr.

Consideration of the effects of rising educational and professional standards on the functions of the elementary school and the teacher. Ways and means of stimulating in-service growth in professional judgment and techniques. Practical approaches to typical problems and situations involving the improvement of instruction.

Not open to students who have credit for Education 652.

749. Organization of the Elementary School. Three credit hours. Spring Quarter. Mr. Harding.

Application of research findings to selection and use of materials of instruction; logical and psychological organization of subject matter and educative activities; evaluation of materials and procedures.

Not open to students who have credit for Education 653.

753. School Problems in Child Development. Three credit hours. Winter Quarter. General prerequisites must include Education 747 and 748. Miss Streitz.

Workshop in Elementary Education. Registration in the course is restricted to students with professional experience and is subject to instructor's approval.

Not open to students who have credit for Education 662.

***763. Direction and Supervision of Elementary Teacher Education. Three credit hours.**

An intensive study of the problems confronting the director of student teaching, the supervisors of student teachers and critic teachers. Special attention is given to the development of the teacher as a person, enriched content courses, reorganization of methods courses, have intimate relation of theory and practice, widening the scope of student teaching, and creative supervision of student teaching.

Not open to students who have credit for Education 658.

NOTE: For course in Health Education for Elementary Teachers, see the Department of Physical Education, Course 609.

FOR GRADUATES

800 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51, also on page 140.

824. The Elementary School Curriculum. Three credit hours. Autumn Quarter. Miss Streitz.

A critical study of the reorganization, construction, and administration of the elementary school curriculum in the light of modern educational principles and objectives, the data contributed by research and the best current practices found throughout the country. Special attention will be given to organization of staff for curriculum study, to the basic issues in realizing a sound curriculum and to the installation, adaptation and administration of the revised curriculum.

825. Elementary School Administration and Supervision. Three credit hours. Winter Quarter. Mr. Burr.

A critical analysis of current practice in the organization, administration, and supervision of the elementary school. Formulation of guiding principles and effective program, practical implications of creative democratic leadership in efficient management, in the diagnosis of teaching, in the professional development of personnel, in the creative use of school and community activities, and in the broader public and professional relations of the school.

***826. Practice in Supervision. Three credit hours. Spring Quarter. Open only by permission of the instructor. Miss Zirbes.**

Typical school problems will be used to provide practice in the techniques of supervisory service. Emphasis will be placed on the application of principles of supervision to actual classroom situations.

GUIDANCE

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

661. Guidance Problems in the Elementary School. For description see page 145 under Elementary Education.

750. Fundamentals of Guidance. Three credit hours. One Quarter. Autumn and Winter.

* Not given in 1954-1955.

A basic but advanced course for all students desiring a comprehensive knowledge of the history, theory and practice of guidance. Especially for graduate students desiring to specialize in this field. The course considers the aims, materials, techniques, and research instruments of all major divisions of guidance service.

751. Supervised Practice in Counseling. Three to five credit hours. Autumn and Spring Quarters. One two-hour recitation and discussion period and two to six hours laboratory each week. Lectures, reports, demonstrations, and laboratory practice. General prerequisites must include Education 750 and Psychology 684 or equivalent.

Consideration of counseling problems at different school levels including out-of-school youth. Studies of counseling techniques and aids, counseling practice with pupils, parents, classroom and home-room teachers, visiting teachers, and administrative officers. Experience in using counseling data supplied by school physicians, nurses, psychologists, psychometrists, psychiatrists, employers and others. Of interest to those preparing to counsel with youth.

752. Guidance through Social-Economic Studies. Five credit hours. Winter Quarter. General prerequisites must include Education 750, or equivalent.

This course is organized with particular reference to the needs of school advisers and teachers of social-economic (vocational) studies for major purposes of guidance.

†754. The Administration of Guidance Programs. Three credit hours. Autumn Quarter. General prerequisites must include Education 750, Education 727 and teaching experience or equivalent. Mr. Arisman.

Designed for school superintendents and high school principals and other executive officers in junior and senior high schools and junior colleges. Critical examination of the organization and administration of guidance programs in large and small school systems; the development of guidance programs for the school systems represented by the class membership.

755. Survey of Guidance Techniques. Three credit hours. Winter Quarter. General prerequisites must include Education 750 or its equivalent.

An overview of the various patterns and techniques of guidance procedure. Of interest not only to prospective specialists in guidance, but designed also for all who want a comprehensive survey of this field. Studies are made of requirements and opportunities for preparation in various lines of guidance specialization.

756. School and Community Resources for Guidance. Four credit hours. Autumn Quarter. General prerequisites must include Education 750 or its equivalent.

A study of (a) organization and administration of school systems and school communities with particular reference to the needs of guidance workers, and (b) information needed by guidance workers concerning educational opportunities available to high school students and graduates. Emphasis will be placed upon the functional relation of the guidance worker to different types and concepts of school organization, upon information concerning in-school and out-of-school educational opportunities and choices at all levels, and upon teaching pupils how to evaluate for themselves in-school and out-of-school opportunities and choices.

HIGHER EDUCATION AND TEACHER TRAINING

FOR ADVANCED UNDERGRADUATES AND GRADUATES

700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

768. Directing Student Teaching in Secondary Schools. Three credit hours. Winter Quarter. General prerequisites must include Bachelor's degree, secondary certification, and teaching experience. Mr. Andrews.

An intensive study of the problems confronting supervising (critic) teachers, and college supervisors and directors of student teaching in secondary schools. Attention will be given to the understandings and techniques effective in facilitating the adjustment and development of student teachers in teaching procedures, personality growth, and human relations. During the Quarters when such facilities are available, a part of the work of the course will be of a laboratory character, working with student teachers.

FOR GRADUATES

800 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51, also on page 140.

† Not given during the academic year, 1954-1955.

812. Seminar in Methods of College Teaching in the Sciences Basic to the Health Professions. Two credit hours. Spring Quarter. Mr. Anderson and others.

The major problems of teaching in higher education. Motivation, the laws of learning, major principles of the teaching of science, the use of visual aids, laboratory techniques, planning, presentation, and evaluation. Each student will undertake a special study of some phase of teaching in his major area. Open only by permission of one of the instructors.

832. The Junior College Movement. For description see page 154 under Secondary Education (General Field).

845-846. Higher Education I; Higher Education II; Basic Courses. Five credit hours. Spring Quarter. The work of each Quarter is so arranged that either course may precede the other. General prerequisites must include the satisfaction of basic course requirements for all graduate students in education. Open only to advanced graduate students. Mr. Anderson.

A basic survey of problems in higher education, particularly as these relate to theory, history, organization and administration, curriculum and method, and student personnel, including measurement.

848. Theories and Curricula of Higher Education. Five credit hours. Winter Quarter. General prerequisites must include five hours in higher education and the satisfaction of basic course requirements for all graduate students in education. Mr. Kircher.

A study of current theories of general education and of representative and experimental college programs in the United States.

850. Teacher Training. Five credit hours. Autumn Quarter. General prerequisites must include satisfaction of basic course requirements for all graduate students in education. Mr. Anderson.

A study of the problems of history, organization, administration, curriculum and method, student personnel (including measurement) peculiar to teacher training institutions.

851. Teaching and Supervising Science Education in Higher Education. Four credit hours. Spring Quarter. Lectures, readings, field work, observations. General prerequisites must include major or minor in Science Education, Education 684 or equivalent, and at least fifteen hours of graduate credit in education. Mr. Richardson.

Problems of preparing courses and curricula for teacher preparation programs in science, directing student teaching, on- and off-campus co-operative arrangements, provision for equipment and evaluation.

852. Evaluation in Higher Education. Three to five credit hours. Winter Quarter. Two meetings each week. Mr. Harding.

A course for college instructors and research workers, to acquaint them with the techniques used in measuring attainment in the several fields of college instruction. Students will have an opportunity to construct examinations and administer them.

NOTE: For course in elementary education supervision see 763, Direction and Supervision of Elementary Teacher Education.

MINOR PROBLEMS

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

600. Minor Problems. One to four credit hours. Autumn, Winter, and Spring Quarters. Students must have approval of instructor for registering.

(A) Business Education. Mr. Hanna, Miss Wells.

(B) Adult Education. Mr. Hendrickson, Mr. Nisonger.

(C) Elementary Education. Miss Streitz, Mr. Burr, Mr. Harding, Mr. Dickson.

(D) Guidance. Mr. Arisman.

(E) Higher Education. Mr. Anderson, Mr. Hullfish, Mr. Kircher.

(F) History of Education and Comparative Education. Mr. Williams, Mr. Sutton.

* Not given in 1954-1955.

- (G) Industrial Arts Education. Mr. Warner, Mr. Haws.
- (H) Industrial-Vocational Education.
- (I) Philosophy of Education. Mr. Hullfish, Mr. Kircher.
- (J) Radio and Television. Mr. Tyler.
- (K) Secondary Education. Mr. Alberty, Mr. Eikenberry, Mr. Eckelberry, Mr. Mendenhall, Mr. Laughlin.
- (M) Educational Administration. Mr. Reeder, Mr. Heck, Mr. Bennett, Mr. Campbell, Mr. Sessions, Mr. Herrick, Mr. Flesher.
- (N) Teaching of English. Mr. Seely, Mr. Eberhart.
- (O) Teaching of Foreign Languages. Mr. Tharp.
- (P) Teaching of Mathematics. Mr. Fawcett, Mr. Lazar.
- (Q) Teaching of Sciences. Mr. Cahoon, Mr. Haub, Mr. Richardson.
- (R) Teaching of Social Studies. Mr. Griffin, Mr. Jewett.
- (S) Audio-Visual Materials of Instruction. Mr. Dale, Miss Williams, Mr. Woelfel.
- (T) Special Education. Miss Cassidy, Miss Sanderson, Mr. Nisonger, Miss Rosebrook.
- (U) Speech. Mr. Knower, Miss Sanderson.
- (V) Research Techniques. Mr. Fleisher, Mr. Mooney, Mr. Woelfel, Mr. Dale.
- (W) Library Science. Miss Heller.

PHILOSOPHY AND HISTORY OF EDUCATION

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

607. Philosophy of Education. Three credit hours. One Quarter. Autumn, Winter, Spring. Open by permission of the instructor. This course should be taken after student teaching or concurrently with it. Mr. Hullfish, Mr. Kircher.

A consideration of the distinctive function or purpose of education in the social order and the bearing of this purpose on problems of organization and administration, the selection of subject matter, and classroom procedures.

624. Social Education. Three credit hours. Spring Quarter. Lectures and discussions. Mrs. Robbins.

Give studies of community schools; school uses of community resources in curriculum and public interpretation; problems in adapting school to community; the teacher's community contacts.

632. The History of Western Education. Four credit hours. One Quarter. Autumn, Winter, Spring. Mr. Williams, Mr. Sutton.

Development of educational systems in the Western world since ancient times. Emphasis on education in its relation to other social institutions and on the continuity of its evolution through the centuries.

Not open to students who have credit for Education 507.

636. Historical Foundations of American Education. Four credit hours. One Quarter. Winter and Spring. General prerequisites must include Education 632 or its equivalent. Mr. Sutton.

After a brief survey of the colonial beginnings, emphasis will be laid upon the early national period, the expansion after the Civil War, and the reconstruction of American education since 1900. Study of original sources. The evolution of elementary, secondary, and higher education.

†**641. History of Vocational Education and the Practical Arts.** Three credit hours. Autumn Quarter. Mr. Warner.

The history and theory of activities related to agriculture, business, industry, and home making as a part of education, and their relation to the general theory and practice of education.

†**642. History of Physical and Health Education.** Three credit hours. Spring Quarter. Mr. Daniels.

An historical survey of physical and health education beginning with the physical education of ancient Greece, with special emphasis on recent and contemporary developments in Europe and America.

757. Conceptions of Mind in Educational Theory. Three credit hours. Autumn Quarter. Mr. Hullfish.

A study of the doctrines of mind that have exercised a determining influence upon educational theory and practice.

Not open to students who have credit for Education 610.

† Not given during the academic year, 1954-1955.

758. The Thinking Process in Its Educational Bearings. Three credit hours. Spring Quarter. Mr. Hullfish.

A study of the thinking process for the purpose of tracing its implications for educational theory and classroom practice.

Not open to students who have credit for Education 611.

759. Modern Trends in Educational Philosophy. Three credit hours. Winter Quarter. Mr. Kircher.

A discussion of alternative philosophies and their implications for current educational theory.

Not open to students who have credit for Education 617.

760. Moral and Religious Ideals in Education. Three credit hours. Spring Quarter. Mr. Kircher.

A consideration of types of moral ideals, of the relation of moral and religious values to school subjects, and of the past and present relationships of religion and public education in the United States.

Not open to students who have credit for Education 620.

775. The History of Educational Thought: Ancient and Medieval. Three credit hours. Autumn Quarter. General prerequisites must include four Quarter hours in the history of education. Mr. Williams.

Study, analysis, and discussion of some of the major educational treatises written during the ancient and medieval periods. The educational philosophy of Plato, Aristotle, Xenophon, Quintilian, and selected Moslem and Christian writers, their influence on the subsequent course of educational history.

Not open to students who have credit for Education 635.

776. The History of Educational Thought: Modern. Three credit hours. Spring Quarter. General prerequisites must include four Quarter hours in the history of education. Mr. Williams.

Study, analysis, and discussion of some of the major educational treatises written since 1500 A.D. The educational philosophy of Milton, Locke, Rousseau, Kant, Newman, Spencer, and others, with consideration of their influence on contemporary theory and practice in education.

Not open to students who have credit for Education 635.

777. Comparative Education. Three credit hours. Autumn Quarter. General prerequisites must include Education 632, 636, or the equivalent. Mr. Sutton.

A general introduction to the study of comparative education to help the student develop an international view of educational problems and a technique for tracing educational differences among countries to variations in their cultural histories. A study of schools and other educational agencies in England, France, Germany, the USSR, and other countries, their relation to social and political institutions and ideas, and a comparison with American education.

Not open to students who have credit for Education 638.

778. Foreign Educational Systems. Three credit hours. Spring Quarter. General prerequisites must include Education 632, 636, or the equivalent. 638 is not a prerequisite but recommended as helpful. Mr. Sutton.

The educational organization of one or more selected foreign countries in relation to public policy, studied as an aid to international understanding and preparation for educational service abroad. Special attention will be given to the development of higher education.

Not open to students who have credit for Education 640.

FOR GRADUATES

800 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENT OF INSTRUCTION," page 51.

809. Social Philosophies and Their Educational Bearings. Three credit hours. Spring Quarter. General prerequisites must include Education 757 and 759. Mr. Hullfish.

A study of social philosophies in terms of their significance for educational procedures and programs. Particular attention will be given to a critical evaluation of democratic values and of conflicting social ideologies.

810. The Educational Philosophy of John Dewey. Three credit hours. Autumn Quarter. General prerequisites must include Education 757 and 759. Mr. Hullfish.

A systematic study of the writings of John Dewey in their bearing upon educational theory and practice.

859. Comparative Philosophy of Education. Three credit hours. Spring Quarter. General prerequisites must include Education 757 and 759. Mr. Kircher.

This course is designed to give the more advanced student an opportunity to develop a sufficient command of the field of comparative philosophy of education to speculate reliably on the educational implications of selected schools of thought.

RESEARCH

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

802. Research Methods and Thesis Preparation. Three credit hours. Winter Quarter. Mr. Reeder.

Emphasizes methods of research with special attention to the preparation of theses. The following topics, among others, are treated: types of research; criteria for selecting and planning the problem; preparing the working and the final bibliographies; the securing of data for various types of research; the organization, presentation, and interpretation of material; the form of citations; and the preparation of statistical tables and pictorial illustrations.

804. Educational Experimentation. Two to five credit hours. Autumn Quarter. One two-hour laboratory period each week with additional weekly conference periods in proportion to credit hours taken. May be repeated for a total of five Quarter hours. Mr. Harding.

A study of applications of the experimental method to educational problems. Includes consideration and analysis of significant experiments and the influence of experimentation upon current trends in elementary, secondary, and higher education. Especial attention is given to the definition of problems, development of experimental designs, and evaluation of data in thesis and dissertation research.

835. Advanced Studies in Education. Three credit hours for one Quarter only. All Quarters. Open only to graduate students pursuing the Master of Education program. General prerequisites must include permission of the instructor. A nonreturnable laboratory fee of \$10.00 will be assessed.

This course is designed to enable candidates pursuing the Master of Education degree to demonstrate ability to attack and deal with problems independently. The candidate shall meet this requirement by undertaking either a field-service project or a research study in education.

By permission of the instructors, students enrolled in this course may register for one of the following appropriate sections.

- (A) Business Education. Mr. Hanna, Miss Wells.
- (B) Adult Education. Mr. Nisonger, Mr. Hendrickson.
- (C) Elementary Education. Miss Streitz, Mr. Burr, Mr. Hardin, Mr. Dickson.
- (D) Guidance. Mr. Arisman.
- (E) Higher Education. Mr. Anderson, Mr. Hullfish, Mr. Kircher.
- (F) History of Education and Comparative Education. Mr. Williams, Mr. Sutton.
- (G) Industrial Arts Education. Mr. Warner, Mr. Haws.
- (H) Industrial-Vocational Education.
- (I) Philosophy of Education. Mr. Hullfish, Mr. Kircher.
- (J) Radio and Television. Mr. Tyler.
- (K) Secondary Education. Mr. Alberty, Mr. Eckelberry, Mr. Eikenberry, Mr. Mendenhall, Mr. Laughlin.
- (M) Educational Administration. Mr. Reeder, Mr. Heck, Mr. Campbell, Mr. Flesher, Mr. Herrick.
- (N) Teaching of English. Mr. Seely, Mr. Eberhart.
- (O) Teaching of Foreign Languages. Mr. Tharp.
- (P) Teaching of Mathematics. Mr. Fawcett, Mr. Lazar.
- (Q) Teaching of Science. Mr. Cahoon, Mr. Richardson.
- (R) Teaching of Social Studies. Mr. Griffin, Mr. Jewett.
- (S) Audio-Visual Materials of Instruction. Mr. Dale, Mr. Woelfel.
- (T) Special Education. Miss Sanderson, Miss Cassidy, Mr. Nisonger, Miss Rosebrook.
- (U) Speech. Miss Sanderson, Mr. Knower.
- (V) Research Techniques. Mr. Flesher, Mr. Dale, Mr. Mooney, Mr. Woelfel.

950. Research in Education. Autumn, Winter, and Spring Quarters. Students may with the approval of their advisers register for more than one section of 950 or for the same section two or more times.

- (A) Business Education. Mr. Hanna, Miss Wells.
- (B) Adult Education. Mr. Hendrickson, Mr. Nisonger.
- (C) Elementary Education. Miss Streitz, Mr. Burr, Mr. Harding, Mr. Dickson.
- (D) Guidance. Mr. Arisman.
- (E) Higher Education. Mr. Hullfish, Mr. Anderson, Mr. Kircher.
- (F) History of Education and Comparative Education. Mr. Williams, Mr. Sutton.
- (G) Industrial Arts Education. Mr. Warner, Mr. Haws.
- (H) Industrial-Vocational Education.
- (I) Philosophy of Education. Mr. Hullfish, Mr. Kircher.
- (J) Radio and Television. Mr. Tyler.
- (K) Secondary Education. Mr. Alberty, Mr. Eikenbarry, Mr. Eckelberry, Mr. Mendenhall, Mr. Laughlin.
- (M) Educational Administration. Mr. Reeder, Mr. Heck, Mr. Campbell, Mr. Flesher, Mr. Herrick.
- (N) Teaching of English. Mr. Seely, Mr. Eberhart.
- (O) Teaching of Foreign Languages. Mr. Tharp.
- (P) Teaching of Mathematics. Mr. Lazar, Mr. Fawcett.
- (Q) Teaching of Sciences. Mr. Cahoon, Mr. Haub, Mr. Richardson.
- (R) Teaching of Social Studies. Mr. Griffin, Mr. Jewett.
- (S) Audio-Visual Materials of Instruction. Mr. Dale, Mr. Woelfel.
- (T) Special Education. Miss Sanderson, Miss Cassidy, Mr. Nisonger, Miss Rosebrook.
- (U) Speech. Mr. Knower, Miss Sanderson.
- (V) Research Techniques. Mr. Flesher, Mr. Dale, Mr. Mooney, Mr. Woelfel.

SCHOOL LIBRARY SCIENCE

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

*645. The Library in the Modern School. Three credit hours.

A course designed primarily for teachers, supervisors, and administrators to acquaint them with the place of the school library in modern education. Objectives of school library service, integration of library and instruction, library standards, selection of personnel, housing and equipment of the library, costs of service, and broader concepts of library materials will be investigated.

NOTE: Attention is called to the service course (Psychology 680) offered for those majoring in Elementary or Secondary Education or the Superintendency.

646. Enriching Curriculum Units Through Use of Library Materials. Three credit hours. Autumn Quarter. Miss Heller.

This course is designed to acquaint the student with library resources and materials of all kinds which will vitalize and give background to typical units of the school curriculum. Includes selection and study of materials correlating with subjects chosen for study in both elementary and secondary schools. Practice will be given in deciding upon appropriate study materials and in making bibliographies for selected subjects. Attempt will be made to show that the same materials may be used to enrich more than one subject.

647. Reference Work in the School Library. Three credit hours. Winter Quarter.

The course includes study of the various reference books, such as encyclopedias, dictionaries, atlases, handbooks, gazeteers, and pamphlets, bulletins, government publications, pictures, museum objects, and other audio-visual aids. Practice in handling reference questions is provided.

*648. Library Guidance for Adolescent Readers. Three credit hours. Spring Quarter.

A survey of the nature and content of books suitable for use in meeting the recreational reading needs of the adolescent group. The recreational reading program is considered as one cutting across the entire book collection and meeting a variety of interests, including those arising in any teaching area. Emphasis will be placed upon recreational reading as a means of furnishing background for the study of a foreign language, enriching interests arising in social studies classes, extending mathematical understandings, strengthening science interests, correlating with English teaching programs, broadening experiences in the arts, or helping in the solution of personal problems.

Demonstration and discussion of methods of stimulating and directing young people's reading will be provided.

* Not given in 1954-1955.

SECONDARY EDUCATION

The General Field

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

601. Radio and Television in Education. For description see page 144 under Elementary Education.

602. Audio-Visual Materials of Instruction. For description see page 144 under Elementary Education.

649. Praticum in Problems of Public Education. Three credit hours. Autumn, Winter, and Spring Quarters. This course may be repeated until nine credit hours have been earned.

Open only to experienced teachers, administrators and supervisors with junior standing or above. Groups must be organized around specific problems and available staff. Requests from school systems must be received by the department chairman far enough in advance to allow ample time for planning.

676. Teaching in the Core Program in the Secondary School. Three credit hours. Winter Quarter. Mr. Alberty.

A course for prospective teachers and teachers in service who are interested in learning how to work effectively in schools which utilize the core curriculum type of organization. A critical study will be made of current practices in the field through analysis of existing curricula and procedures and through observations of and participation in the core program of the University School. Careful consideration will be given to the techniques of selecting and organizing course materials and to the cooperative planning of units of work. The group will undertake building at least one resource unit.

699. Student Activities in the Secondary School. Three credit hours. Spring Quarter. Mr. Eikenberry.

The place of "extra-curricular" activities in the secondary school program. Consideration will be given to home-room activities, pupil participation in school government, assemblies, clubs, publications, debating and dramatics, athletics, honor societies, social activities, control of participation in activities, and financial administration of activities. Of special interest to high school teachers and high school principals.

703. The Role of the Secondary School in the Social Order. Three credit hours. Autumn Quarter. Mr. Alberty.

An orientation course for teachers, principals, and superintendents which deals with conflicting basic philosophies of secondary education, historical backgrounds, present practices and trends. The relation of the secondary school to the immediate and wider community will be given consideration.

704. Laboratory Study of the Ohio State University School. (For description see page 145 under Elementary Education.)

705. Present-Day Trends in the Organization of Secondary Education. Three credit hours. Autumn Quarter. Mr. Eikenberry.

A critical examination of present-day trends in the organization of American secondary education. Consideration will be given to district organization, the junior college movement, special types and comprehensive schools, part-time, continuation, and evening schools, state and federal control.

707. The Evolving Secondary School Curriculum. Three credit hours. Autumn Quarter. Mr. Alberty.

A basic course for teachers, principals, and superintendents, which deals with current theories and practices in curricula making in the light of historical backgrounds. Special emphasis is given to a study of the curricula of some of the leading public, private, and laboratory schools of the United States.

708. Evaluation of Secondary Schools. Three credit hours. Autumn Quarter. Lectures, reports, field studies. Mr. Laughlin.

A critical study of techniques of evaluating secondary schools. Attention will be given to current evaluation practices with special emphasis on the development of procedures appropriate to Ohio schools.

Not open to students who have credit for Education 838.

709. Administration of the Secondary School. Three credit hours. Autumn Quarter. General prerequisites must include graduate standing and prerequisite or concurrent Education 703 or 705. Mr. Eikenberry.

A critical study of the major problems and issues in the organization and administration of the secondary school. Of special interest to high school principals and county, exempted village, and city superintendents.

Not open to students who have credit for Education 830.

FOR GRADUATES

600 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51, also on page 140.

829. Supervision in the Secondary Schools. Three credit hours. Spring Quarter. General prerequisites must include Education 701 or 702 or 703 or 705. Mr. Mendenhall.

A study of the problems involved in the in-service training and improvement of teachers, improvement in learning, techniques of classroom visitation, teacher rating, teachers' meetings, teacher participation in policy and program making, and the like.

831. Laboratory in Curriculum Development in Secondary Schools. Two to five credit hours. Spring Quarter. General prerequisites must include Education 707 or the equivalent. Mr. Mendenhall.

An advanced course in the techniques of curriculum construction and organization, oriented in terms of the actual problems which teachers and administrators face in revising actual programs. The course will be used primarily as a laboratory for the study of specific problems in curriculum development which are of concern to the students enrolled.

832. The Junior College Movement. Three credit hours. Spring Quarter. General prerequisites must include Education 705, 707 or the equivalent. Mr. Eikenberry.

The origin and development of private, state and municipal junior colleges, including a critical evaluation of general and terminal education on the post-high-school level.

841. Planning and Guiding Learning Activities in the Secondary School. Three credit hours. Winter Quarter. General prerequisites must include Education 703, or 705 and 707. Mr. Alberty.

An advanced course for secondary-school teachers of experience. It deals with the philosophy, principles and generalized techniques involved in selecting and organizing resource materials such as library and teaching aids; developing units of work; planning for student participation; teaching controversial issues; providing for classroom guidance; organizing field trips; and planning for work experience. Directed observations of teaching will be required.

844. Administrative Problems of the High School Principal. Two or three credit hours. Spring Quarter. General prerequisites must include Education 830. Mr. Eikenberry.

An advanced course dealing with selected problems in the administration of secondary schools.

Teaching of English

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

669. Literary Materials for English and the Social Studies. Three credit hours. Autumn Quarter. Lectures, readings, and problem assignments. Recommended for students planning to teach English, history, or social studies in junior or senior high schools. Mr. Eberhart.

The course is designed (1) to acquaint English teachers with a wide variety of novels, short stories, poems, plays, biographies, and essays which are especially suitable for pupils in junior and senior high school, and (2) to familiarize teachers of history and social studies with literary selections which serve to illuminate typical subjects of study in these fields. Consideration will be given to standards for the selection of literary materials and the use of those materials and the secondary school curriculum.

670. Teaching Literature in the High School. Five credit hours. One Quarter. Autumn and Spring. Lectures, readings, participation. Mr. Seely.

Emphasis is given to such matters as the objectives of the high-school literature program; criteria for the choice and grade-placement of literature in high school; specific methods suitable for teaching the various types of literature; the correlation of the activities in literature with those in the language aspects of the English studies; the interrelations between literature and other phases of the curriculum.

671. Teaching the English-Language Studies in High School. Five credit hours. One Quarter. Autumn, Winter, Spring. Lectures, readings, participation. Mr. Seely.

Emphasis is given to such matters as the objectives of the English-language studies in high school; the teaching of the language mechanics; the teaching of the various types of oral and written composition; the role of the school as a whole in promoting students' language competence.

†674. The Supervision of Journalism in Secondary Schools. Three credit hours.

This course is designed for persons who have been teaching journalism in secondary schools, or who act as faculty advisers for school newspapers, magazines, or annuals. It includes a general survey of the editorial, publishing, and mechanical phases of school newspapers and other publications with emphasis on those aspects which are of particular value to teachers.

Open to students registered in the College of Education and to graduate students.

Not open for graduate credit to graduate students majoring in journalism.

Teaching of Foreign Languages

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

***690. The Teaching of German.** Three credit hours. Winter Quarter. Three recitations each week; observations. Given in alternate years. Mr. Wonderley.

Values. Critical study of objectives and methods. Textbook selection. Classroom procedures. Readings, discussions, and reports.

691. The Teaching of English as a Foreign Language. Three credit hours. Spring Quarter. Lectures, demonstrations, readings, observations. Open by permission of the instructor to properly qualified students, such as mature, experienced teachers, or foreigners preparing to teach English to their own nationals. Mr. Tharp.

Problems and scope of teaching English to foreigners. English considered as a foreign language, materials and methods.

692. Methods and Techniques of Teaching Romance Languages. Two to seven credit hours. Education 692 may be taken more than once provided the total credit received does not exceed seven hours. General prerequisites must include a major or minor in French or Spanish. Section A is required of all students who intend to complete a teaching major or minor in a Romance Language. Section B is optional, but it should be elected if possible concurrently with student teaching. Mr. Tharp.

Section A. Five credit hours. Autumn Quarter. Five meetings each week, with observation in a high school class. Lectures, readings, discussions, and conferences. Values; objectives; textbook analysis; examinations and making; professional advancement. Demonstrations and practical problems in methods of teaching grammar, pronunciation, and reading.

Section B. Two credit hours. Autumn and Spring Quarters. One two-hour meeting each week. Choice of course content; preparation of teaching materials; evaluation of classroom procedures. Practice in use of audio-visual aids, songs, folkdances, and all types of realia.

694. The Teaching of Latin. Three credit hours. Spring Quarter. Three recitations each week; observations. Mr. Titchener.

† Not given during the academic year, 1954-1955.

* Not given in 1954-1955.

Values. Teachers' equipment, objectives and methods. Classroom procedures. Lectures and assigned readings.

Teaching of Mathematics

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

659. Teaching of Mathematics in the Secondary Schools. Three credit hours. Winter Quarter. Three lectures each week, with observation and active participation in junior high school mathematics classes for at least ten hours during the Quarter. General prerequisites must include twenty hours of mathematics or the equivalent. Required of students in the College of Education who intend to complete a teaching major or minor in mathematics. Mr. Lazar.

A consideration of the role of mathematics in general education and the relation of mathematics to other fields of learning. The selection of concepts, understandings, appreciations, and skills from arithmetic, informal geometry, and elementary algebra that are especially important for junior high school pupils. A detailed consideration will be given to related teaching procedures.

Not open to students who have credit for Education 687.

660. Teaching of Mathematics in the Secondary Schools. Three credit hours. Autumn Quarter. Three lectures each week, with observation and active participation in senior high school mathematics classes for at least twenty hours of mathematics or the equivalent. Required of students in the College of Education who intend to complete a teaching major or minor in mathematics. Mr. Lazar.

The selection of concepts, understandings, appreciations, and skills from demonstrative plane geometry, intermediate and advanced algebra, solid geometry, and trigonometry. A detailed consideration will be given to related teaching procedures.

Not open to students who have credit for Education 687.

NOTE: This course can be taken prior to or independently of 659.

***689. Field and Laboratory Work for Teachers of Mathematics.** Three credit hours. Spring Quarter. Demonstrations, field work, projects, readings, laboratory work and participation in University School mathematics classes. General prerequisites must include a major or minor in mathematics and Education 687 or the equivalent. Mr. Lazar.

Actual experience with instruments and apparatus in field and laboratory work suitable for boys and girls in the junior and senior high schools. The use of devices and apparatus including the slide rule, the plane table, the alidade, the transit, the angle mirror, the sextant, the hypsometer and clinometer for teaching concepts and skills needed in elementary surveying and mapping. Field and laboratory work and demonstrations will be carried out illustrative of teaching procedures applicable to secondary school classes.

Not open to students who have credit for Education 544.

761. Materials for Teaching Secondary School Mathematics. Three credit hours. Spring Quarter. Lectures, problem assignments, readings, and participation in University School mathematics classes. General prerequisites must include twenty hours of mathematics and twenty hours in psychology and education. Education 687 must be included in the prerequisites or taken concurrently. Mr. Lazar.

Not open to students who have credit for Education 688.

762. The Teaching of Algebraic Concepts. Four credit hours. Autumn Quarter. General prerequisites must include Education 687, or the equivalent. Mr. Lazar.

A course dealing with the role of algebra in the secondary school, including a consideration of significant experiments in the teaching of this subject, major understandings and outcomes, the selection of appropriate topics, the development of relational thinking, and the evaluation of outcomes.

* Not given in 1954-1955.

FOR GRADUATES

800 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51, also on page 140.

840. The Teaching of Geometric Concepts. Four credit hours. Winter Quarter. General prerequisites must include Education 687 or the equivalent. Mr. Fawcett.

A course dealing with the role of geometry in the secondary school, including a consideration of recent experiments in the teaching of geometry, the significance of undefined terms, definitions, assumptions and generalizations, current tendencies in the selection of subject matter, and the evaluation of outcomes. Special emphasis is given to the use of geometric content as a means for developing an understanding of the nature of proof and to the importance of this concept in any field of thought.

Teaching of Nursing

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

685. The Teaching of Nursing. Three credit hours. Autumn Quarter. Mrs. Pease.

Objectives and methods, selection of materials, classroom procedures, readings, discussions, and reports.

Teaching of Science

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

680. Science Materials for Junior and Senior High Schools. Three credit hours. Spring Quarter. Lectures, readings, problem assignments, and participation in the University School science classes. General prerequisites must include a major or minor in science and Education 684, or the equivalent. Mr. Richardson.

This course is planned to give teachers of junior and senior high school science experience with significant teaching materials. Emphasis is placed upon planning, use, and evaluation of use. Visual and auditory materials, evaluation instruments, and materials useful to critical thinking are utilized. Sources and their evaluation are stressed. Materials are obtained, prepared and organized for use in science classes.

681. Laboratory Practicum for Teachers of Science. Two to five credit hours. Winter Quarter. Demonstrations, laboratory work, construction of apparatus. Central prerequisites must include Education 683 or 684 or equivalent, and major or minor in one or more of the following: physics, chemistry, physics-chemistry-general science, biology. Graduate students must have the permission of the instructor to enroll during the academic year. Mr. Richardson.

Students have experience with such techniques as glass blowing, wood and metal working, and those of electrical, photographic, and chemical nature as they are related to apparatus, materials and tools used in science courses in secondary and elementary schools. The preparation, assembly, and construction of demonstration and laboratory apparatus and visual aids are related to their use in science teaching. The work is adapted to the individual needs and concerns of students.

Education 681 may be taken more than once provided the total credit received for Education 681 and 539 does not exceed five Quarter hours.

†**682. Field Laboratory in Field Conservation.** For description see page 164 under Workshops and Field Experience.

683. The Teaching of Biology. Three credit hours. Spring Quarter. Three recitations each week: observations. Mr. Haub, Mr. Taft.

The work will include lectures and demonstrations by the students of the best methods of presenting botany, zoology, and biology to high school students.

† Not given during the academic year, 1954-1955.

684. The Teaching of General and Physical Science. Three credit hours. One Quarter. Autumn and Spring. Lectures, reading observations and participation in the University School science class. Graduate students must have permission of the instructor to enroll during the academic year. Mr. Cahoon.

A study of the problems and techniques in the teaching of general and physical science courses in junior and senior high schools. Objectives, planning, use of demonstrations and laboratory experiments, texts and reference materials, pupil projects, trips, teaching and evaluating scientific thinking, directed study, visual aids, professional literature.

***706. Problems in Teaching and Supervising Science in the Junior and Senior High School.** Four credit hours. Winter Quarter. Lectures; student reports, laboratory. General prerequisites must include teaching or supervisory experience or ten hours of graduate work in secondary or elementary education, and Education 684 or 680. Mr. Richardson.

Planned for teachers who are working with student teachers in their classes, or who expect to work with student teachers, and for those concerned with the supervision of teacher training programs in the science area. Objectives, curricula, recent trends, planning "lessons" and pupil experiences, techniques, classroom management, sources of teaching aids, evaluation of teaching, professional literature.

***851. Teaching and Supervising Science Education in Higher Education.** For description see page 148 under Higher Education and Teacher Training.

Teaching of Social Studies

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

669. Literary Materials for English and the Social Studies. For description see page 154 under Secondary Education (Teaching of English).

677. The Teaching of the Social Studies I. Five credit hours. One Quarter. Autumn and Spring. Five lectures each week; observations. General prerequisites must include twenty hours in the social studies and a course in theory and practices in secondary school teaching or equivalent. Mr. Griffin.

An examination of different theories of the role of social studies materials within the learning process, with particular attention to their impact upon the beliefs, attitudes, and values of secondary school students. Illustrative materials will be drawn primarily from history, with some attention to the other social studies. Special emphasis is given to the use of social studies materials in clarifying the contrast between authoritarianism and democracy, to the function of information within the reflective process, and to the possible contributions of the social studies teacher within the core curriculum.

678. The Teaching of the Social Studies II. Three credit hours. One Quarter. Autumn and Winter. Lectures, discussions, observations. General prerequisites must include twenty hours in the social studies and a course in theory and practices in secondary school teaching or equivalent. Mr. Jewett.

A continuation of Education 677. The illustrative materials will be drawn primarily from the fields of economics, sociology, and political science, with some attention to geography and anthropology.

Teaching of Speech

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

668. Methods and Techniques in Speech and Hearing Therapy. Five credit hours. Autumn Quarter. General prerequisites must include twenty hours in speech correction. Miss Sanderson.

This course is designed for prospective teachers of speech and hearing therapy, who wish to organize and administer effective programs of work in the public schools. Careful study will

* Not given in 1954-1955.

be made of equipment and materials important in furthering diagnosis and therapy of speech disorders, and of community agencies and resources which can serve as valuable aids in the program. Participation in field service is an essential in this course.

675. The Teaching of Speech. Five credit hours. Winter Quarter. General prerequisites must include a course in theory and practices in secondary school teaching and twenty hours in speech. Miss Sanderson.

This course is designed for prospective teachers of speech in junior and senior high schools. It includes a study of the purposes and procedures used in teaching public speaking in secondary schools; consideration of the place and potentialities of educational dramatics and out-of-class school plays. Emphasis is placed upon the auditory aids and available materials. The speech teacher's responsibility for the establishment and management of speech clinics is considered.

Necessary classroom, school, and library equipment for the teaching of speech and evaluation of texts in speech receive attention.

SEMINARS

FOR GRADUATES

800 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51, also on page 140.

800. Seminars in Education. Two to five credit hours. Autumn, Winter, and Spring Quarters. Students may with the approval of their advisers register for more than one section of 800 or for the same section two or more times.

These seminars will consider research problems in the several fields of education represented, in terms of the special interests of the students.

- (A) Business Education. Spring Quarter. Mr. Hanna.
- (B) Adult Education. Autumn Quarter. Mr. Hendrickson.
- (C) Elementary Education. Autumn, Winter, and Spring Quarters. Miss Strelitz, Mr. Harding, Mr. Burr, Mr. Dickson.
- (D) Guidance. Autumn, Winter and Spring Quarters. Mr. Arisman.
- (E) Higher Education. Autumn and Spring Quarters. Mr. Anderson.
- (F) History of Education and Comparative Education. Autumn Quarter. Mr. Sutton.
- (G) Industrial Arts Education. Autumn, Winter, and Spring Quarters. Mr. Warner.
- (H) Trade and Industrial Education. Autumn, Winter, and Spring Quarters. Mr. Strobel.
- (I) Philosophy of Education.
- (J) Radio and Television. Autumn, Winter, and Spring Quarters. Mr. Tyler.
- (K) Secondary Education. Autumn, Winter, and Spring Quarters. Mr. Eikenberry, Mr. Alberty, Mr. Mendenhall.
- (M) Educational Administration. Winter Quarter. Mr. Reeder.
- (N) Teaching of English. Autumn, Winter, and Spring Quarters. Mr. Seely, Mr. Eberhart.
- (O) Teaching of Foreign Languages. Spring Quarter. Mr. Tharp.
- (P) Teaching of Mathematics. Winter Quarter. Mr. Lazar.
- † (Q) Teaching of Sciences. Winter Quarter. Mr. Caboon.
- (R) Teaching of Social Studies. Autumn and Winter Quarters. Mr. Griffin, Mr. Jewett.
- (S) Audio-Visual Materials of Instruction. Autumn, Winter, and Spring Quarters. Mr. Dale, Mr. Woelfel.
- (T) Special Education. Spring Quarter. Miss Rosebrock, Miss Cassidy, Mr. Nisonger.
- (U) Speech. Autumn, Winter, and Spring Quarters. Mr. Krower, Miss Sanderson.
- (V) Research Techniques. Autumn, Winter, and Spring Quarters.

899. Interdepartmental Seminar. One to five credit hours. All Quarters. When two or more departments desire to establish an interdepartmental seminar on a subject of common interest the chairmen or authorized representatives of the departments concerned shall prepare a course description including the names of faculty members designated to conduct the seminar. The statement shall be submitted to the Executive Committee of the Graduate School for prior approval.

SPECIAL AND ADULT EDUCATION

Special Education

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

• Not given in 1954-1955.

† Not given during the academic year, 1954-1955.

666. Introduction to the Education of the Mentally Retarded. Three credit hours. Autumn Quarter. General prerequisites must include Psychology 609 and seventeen Quarter-credit hours in Education and allied subjects or the equivalent. Miss Rosebrook.

This course is a critical study of the various methods which are used in teaching the mentally retarded; an evaluation of the research underlying these methods.

Not open to students who have credit for Education 765.

667. Methods of Dealing with Exceptional Children in Schools. Three credit hours. Winter Quarter. Two class meetings and one two-hour laboratory each week. General prerequisites must include Psychology 609. Miss Rosebrook.

This course is designed for elementary and secondary teachers and administrators. A review and evaluation of procedures, methods, and types of organization which may be utilized and developed to serve the needs of exceptional children within the school and classroom situations.

764. Supervised Teaching in Special Classes. Five credit hours. One Quarter. Autumn, Winter, Spring. This course is given only upon special request. Miss Rosebrook, Miss Cassidy.

Practice teaching for qualified students in classes for the mentally retarded, for behavior problem children, for the defective in speech, or for the deaf and the hard of hearing.

Students will be expected to devote one-third of their time, under the supervision of the University instructor in charge, to this course.

†766. Principles and Methods of Teaching Behavior Problem Children. Three credit hours. Spring Quarter. General prerequisites must include Psychology 609 and twenty Quarter-credit hours in education and allied subjects. Miss Rosebrook.

A critical study of principles and methods used in the adjustment of behavior problem children.

772. Preparation of Handicapped Children for Post-School Adjustments. Three credit hours. Winter Quarter. Three class meetings each week. General prerequisites must include Education 667 or equivalent. Mr. Nisonger.

A study of what schools can do for handicapped children through education, guidance, work experience, placement, and follow-up in helping them make successful adjustments to employment, family, and community living. This will include a review of the research studies on the post-school adjustment of handicapped children who have had special education services and those who have not.

773. Practicum in Program Planning for Slow-Learning Children. Three credit hours. Spring Quarter. Three class meetings each week. General prerequisites must include Education 666 or the equivalent. Miss Rosebrook.

A critical appraisal of the philosophy and of the underlying social and economic factors in planning programs for slow-learning children from the kindergarten through secondary levels. A study of the content, procedures, and resources are included.

FOR GRADUATES

800 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51, also on page 140.

820. The Education of Exceptional Children. Three credit hours. Spring Quarter. Three lectures each week. Assigned readings, reports, and field trips. General prerequisites must include Education 727 or permission of the instructor in charge must be obtained. Mr. Heck.

History and development of special schools and classes; types defined; place in education; state encouragement and regulations; types of control; internal government; buildings and rooms; equipment; costs, teacher-training, experience, salaries; selection of other employees; characteristics of children; principles governing admittance, retention, and withdrawal; curriculum—academic, industrial, extra-curricular; methods of follow-up, etc.

Not open to students who have credit for Education 767.

† Not given during the academic year, 1954-1955.

*Adult Education***FOR ADVANCED UNDERGRADUATES AND GRADUATES**

700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

770. Adult Education. Three credit hours. One Quarter. Autumn and Winter. Mr. Hendrickson.

A study of the nature, extent, and significance of adult education. Consideration of the psychological characteristics of the adult, influence of social and economic factors on adult needs, history and types of adult education, present trends, future development.

771. Parent Education. Three credit hours. Winter Quarter. Mr. Hendrickson.

A study of the nature, extent and significance of the parent education movement; home and school relationships in the education of children; methods and resources in parent education; facilities for training professional and lay leaders; place of school administration and teachers in parent education; state programs of parent education.

774. Discussion Methods in Adult Education. Three credit hours. Winter Quarter. Open only to graduate students who have had 20 hours in Education, Agricultural Education, Psychology, or Social Administration. A course for both leaders and those who train leaders of adult groups in "Y's," libraries, nursing education, agricultural extension, public school adult programs, social work, and in other areas of adult group work. Mr. Hendrickson.

Consideration will be given to the various forms of discussion as applied to adult groups, and students will be given actual practice in managing various kinds of discussion groups such as the round table, the forum, the panel, the symposium, and the informal discussion. Clinical analysis of individual difficulties will be made where necessary.

NOTE: For additional courses in special and adult education, see the Bureau of Special and Adult Education, page 88.

FOR GRADUATES

800 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51, also on page 140.

898. Planning Community Adult Education Programs. Three credit hours. Autumn Quarter. General prerequisites must include Education 770, and permission of the instructor must be obtained. Mr. Hendrickson, Mr. Nisonger.

A study of community agencies with adult education programs; how new programs may be developed in terms of needs which are not being met.

NOTE: For additional courses in special and adult education, see the Bureau of Special and Adult Education, page 88.

VOCATIONAL AND PRACTICAL ARTS EDUCATION*Business Education***FOR ADVANCED UNDERGRADUATES AND GRADUATES**

700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

†722. Principles of Business Education. Three credit hours. Autumn Quarter. Mr. Hanna.

For teachers of business subjects in the junior or senior high schools. Meaning, purpose, and scope of business education in secondary schools. Importance of and procedure in making occupational surveys in the field of business education.

723. Organization and Teaching of Office Practice. Two credit hours. Winter Quarter. Miss Wells.

A consideration of the aims and content of office practice courses in the secondary school, with plans and techniques for organizing and teaching the subject matter of the course and its laboratory material.

† Not given during the academic year, 1954-1955.

A special office practice laboratory will be maintained where all members of the class will have an opportunity, through participation, to evaluate teaching materials and outcomes, and study various types of class organization.

724. Administration and Supervision of Business Education. Three credit hours. Autumn Quarter. Mr. Hanna.

A course designed for administrators and supervisors of business education in the junior and senior high school. Courses of study: laboratory facilities, selection and improvement of teachers in service; and other major executive problems.

†725. Improvement of Instruction in Basic Business Subjects. Three credit hours. Open only to graduate students in the area of business education who have had a course in the teaching of bookkeeping and basic business subjects and a minimum of twenty hours of appropriate courses related to the area of business education.

This course will be devoted to consideration of the following problems: the objectives for basic business education including such courses as general business (junior and senior levels), consumer business, business economic, and business organization; the contribution of basic business to general education and to technical business education; selecting and organizing resource materials; developing units of work; planning for student participation.

***726. Improvement of Instruction in Bookkeeping and Related Subjects.** Two credit hours. Spring Quarter. Open only to graduate students in the area of business education who have had a course in the teaching of bookkeeping and basic business subjects, and a minimum of twenty hours of appropriate courses related to the area of business education. Mr. Hanna.

An evaluation of the content, audio-visual aids, and methods of teaching bookkeeping and accounting and such related subjects as business arithmetic and business law. Improvement in materials, tests, standards and teaching procedures will be considered. Emphasis will be placed on individual teaching problems of the class.

Not open to students who have credit for Education 726 as offered before 1951-1952.

†728. Improvement of Instruction in Secretarial Subjects. Two credit hours. Winter Quarter. Open only to graduate students in the area of business education who have had a course in the teaching of secretarial subjects and a minimum of twenty hours of appropriate courses related to the area of business education. Miss Wells.

Improvement of teaching procedures basic to the development of vocational proficiency in typewriting, shorthand, and transcription. Consideration will be given to available instructional materials, measurement of skills, standards of achievement, and special teaching problems of the class.

Not open to students who have credit in Education 726 as offered before 1951-1952.

DISTRIBUTIVE EDUCATION

FOR ADVANCED UNDERGRADUATES AND GRADUATES

700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

780. Methods of Teaching Distributive Education. Three credit hours. Winter Quarter. At least twenty hours of Education, and twenty-five hours in Business Organization, Accounting, and Economics must be included in the general prerequisites or be taken concurrently. Mr. Logan.

The organization and preparation of teaching plans for distributive education classes; analysis of current on-the-job training methods in business establishments.

781. Curriculum Content for Distributive Occupational Subjects. Three credit hours. Winter Quarter. At least twenty hours of Education and twenty-five hours of Business Organization, Accounting, and Economics must be included in the general prerequisites or be taken concurrently. Mr. Logan.

Securing, evaluating, and organizing instructional material and experiences for distributive cooperating education, and adult extension courses. A study of job descriptions of retail, wholesale, and service occupations is made, as these apply to the development of course content.

* Not given in 1954-1955.

† Not given during the academic year, 1954-1955.

†782. **Organization and Administration of Education for the Distributive Occupations.** Three credit hours. At least twenty hours of Education, and twenty-five hours in Business Organization, Accounting, and Economics must be included in the general prerequisites or be taken concurrently. Mr. Logan.

A practical study of the development and operation of a distributive education program; personnel training in the field of distribution, use of advisory committees, functions of the training agency, operation of adult extension programs, evaluation of distributive education, and public relations.

INDUSTRIAL ARTS EDUCATION

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

655. **Industrial Arts in Elementary Schools.** Three credit hours. Winter Quarter. General prerequisites must include twenty-five Quarter hours credit in area of industrial arts. Mr. Warner.

First-hand study of typical modern industries as one means of developing understanding and insight into social and economic backgrounds and their implications. Nature and purposes of industrial arts in the program of elementary education. Selection, study, and development of many typical problems with reference to the various levels of the elementary school.

679. **The Teaching of Industrial Arts.** Five credit hours. Autumn Quarter. Five recitation periods each week; observations. Mr. Haws.

The nature and extent of industrial arts in the total program of education, organization and development of curricular materials, methods of teaching including observations and demonstrations, purposes and techniques of evaluation, the teacher and his profession.

*714. **Selection and Organization of Subject Matter in Industrial Education.** Three credit hours. Spring Quarter. Three recitation periods each week. Mr. Strobel.

Principles and practice in defining specific area and course objectives and their relationship to the objectives of general education. General and specific criteria and controls determining the selection of subject matter and activities. Techniques of analysis applied to various industrial activities for the selection of facts and activities conducive to acquisition of desirable knowledge, skills, and behavior; and the organization of such materials into integrated courses of study and formulation of teaching plans.

715. **Laboratory Planning and Equipment Selection in Industrial Arts.** Three credit hours. Autumn Quarter. Seven periods each week for lecture and laboratory. Permission of the instructor required. Mr. Warner.

Analysis of problems and standards involved in planning rooms and practice in the selection, design, location, installation, and care of equipment in various high school industrial arts laboratories or vocational shops.

*716. **Administration of Industrial Education in Secondary Schools.** Three credit hours. Winter Quarter. Mr. Warner.

Relation of industrial arts and vocational education to the general curriculum and the administrative responsibilities entailed. Courses of study; relative costs; coordination problems; class and shop organization, and the development of an effective program of supervision. Selection of teachers and their improvement in service. Of interest to school administrators and teachers of industrial arts and vocational-industrial subjects.

NOTE: For Survey of Vocational Education, see Education 717 under Trade and Industrial Education.

FOR GRADUATES

800 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51, also on page 140.

856. **Practicum in Industrial Arts Education.** Three to five credit hours. Autumn Quarter. Mr. Warner.

Investigations, reports and discussions concerning: nomenclature, historical development; analysis of professional objectives for their concepts; emphasis by grade levels; criterion basis of content selection and appraisal; teaching methods and devices; physical planning; organization; laboratory operation; evaluation; the teacher and his profession.

* Not given in 1954-1955.

† Not given during the academic year, 1954-1955.

860. Research Methods in Practical Arts and Trade and Industrial Education. Two credit hours. Winter Quarter. Mr. Warner.

An extensive view of research techniques applicable to the practical arts and vocational education; critical review and evaluation of published research examples in these fields; recognition and refinement of problems; study of research treatment; methods of writing and presenting research reports.

By permission of the Chairman of the Department of Education and the Director of the Bureau of Educational Research, students enrolled in this course may obtain credit for research work done under the auspices of the Bureau staff.

866. Research in the Laboratory of Industries. Three or more credit hours. Winter Quarter. Conferences and studies using the activities in the Laboratory of Industries as a basis for research. In addition to the general prerequisites, teaching experience in Industrial Arts or Vocational Industrial Education and permission of the instructor are required. Mr. Warner.

Individual or group studies on a combination practicum and laboratory basis with the publication of either a professional or technical bulletin as a goal. Selection to meet the requirements of the group are suggested by: pupil study, diagnosis and achievement; problems of organizing and supervising a Laboratory of Industries; units of content; studies of industry; analysis of method; experimentation and development programs.

Trade and Industrial Education

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

†695. **Problems in Teaching and Supervising Trade and Industrial Education for Out-of-School Youth and Adults.** Three credit hours. Autumn Quarter. General prerequisites must include teaching or supervisory experience, Education 679 or 714 or equivalent. Mr. Strobel.

An analysis of the factors fundamental to the effective operation of vocational programs for out-of-school groups. Emphasis will be given to the educational, economic and social needs of adult students; facilities, subject matter, instructional methods, teacher education, supervision, coordination, records and reports, types of programs and relationships.

†717. **Survey of Vocational Education.** Three credit hours. Open to superintendents, secondary school principals, supervisors of industrial arts, supervisors of vocational education, guidance workers, teachers of industrial arts and vocational education.

A survey of the five areas of instruction within federal, state, and local program of Vocational Education, Agriculture, Home Economics, Trades and Industries, Distributive Education, and the Guidance Services. Emphasis is given to the purpose of Vocational Education, relationships to total educational programs, responsibility involved, nature and scope of Ohio's program including services for in-school, out-of-school, and adult groups, analysis and appraisal of existing programs within Ohio, discussion of problems and needed developments.

WORKSHOPS AND FIELD EXPERIENCE

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

†682. **Field Laboratory in Conservation Education.** Six to nine credit hours. Not more than eight Quarter hours of credit in this course may be applied toward graduate degrees. General prerequisites must include twenty hours in Education, including Education 684 or equivalent.

This course is designed primarily for teachers in the elementary and secondary schools, and is conducted from Camp Muskingum near New Philadelphia, Ohio. It will employ the entire time of the student. Field trips, laboratory demonstrations, groups discussions, and lectures concerning the subject-matter, curriculum, and methods of teaching in the fields of conservation of soil, water, plant life, wild life, and other resources will be conducted.

798. Field Laboratory Workshop. Three credit hours. Autumn, Winter, Spring Quarters. May be taken for not more than three Quarters with a maximum credit of nine hours.† One two-hour workshop meeting each week in

† Not given during the academic year, 1954-1955.

‡ See footnote on next page.

addition to individual conferences and supervised experimentation. Conferences, observations, and committee reports. Workshops will be conducted in the schools or school centers for which workshops are authorized. Open to teachers, administrators, and supervisors with senior standing or above, who, in the judgment of the committee on workshops, have an educational background in the subject matter of the workshop which will serve as an adequate base for intensive work in this field. Such persons must have the recommendation of the school system or systems in which the workshop is conducted, as well as that of the college staff member directing the workshop.

Graduate students must demonstrate satisfactory ability to deal critically and constructively with a phase of the total problem approved by the workshop director as appropriate for graduate study, and must submit individual papers covering in detail their contribution to the total workshop problem.

Application for a Field Laboratory Workshop should be made to the Chairman of the Department of Education at least one month prior to the opening of the Quarter in which it is desired to conduct the workshop. Each workshop will be concerned with a problem arising in a local school system in Ohio, the solution of which has educational significance also to other school systems in the state or nation. In the attack on such problems, individual members of the workshop will study and experiment with respect to their special fields as they relate to the total problem. Students registered for the course will be required to submit individual papers covering in detail their contributions to the total workshop problem. Graduate students must demonstrate satisfactory ability to deal critically and constructively with a phase of the total problem approved by the workshop director as appropriate for graduate study. The workshop group will be required to prepare, under the supervision of the workshop director, a written report which includes a statement of the problem attacked, the procedures used, the results obtained, and such other information as may be useful in dealing with a similar problem in other countries.

†799. Education Workshop. Eight credit hours for six-week workshops, four credit hours for three-week workshop. Maximum credit twelve hours.† Full time of students required, therefore registrants not permitted to take other University work concurrently. Open only to experienced teachers, administrators, and supervisors with junior standing or above who, in the judgment of the committee on workshops, have an educational background in the subject matter of the workshop which will serve as an adequate base for intensive work in this field.

Graduate students must demonstrate satisfactory ability to deal critically and constructively with a phase of the total problem approved by the workshop director as appropriate for graduate study and must submit individual papers covering in detail their contribution to the total workshop problem.

Education workshops will be arranged upon application of twenty enrollees, provided appropriate faculty staffing is available.

The Education Workshop brings together from a variety of schools persons of similar or closely related specialized interests. In the Workshop they will pool their practical experience and the results of their local experimentation and will systematize and relate this knowledge through intensive study of the literature of the field. The primary purpose will be that of developing sound principles and procedures with respect to professional work in the specific field.

834. Supervised Field Service in Education. Three to five credit hours. Autumn, Winter, and Spring Quarters. Open only to students who hold the degree of Bachelor of Science in Education from The Ohio State University or its equivalent. Open only by arrangement with the Coordinator of Student Field Experience. Mr. Andrews.

Supervised teaching or other approved educational service in a system of schools for a minimum of half of a school year. Critical pre-study of objectives, instruments, and procedures and after-evaluation; a general appraisal of the total experience or certain aspects thereof.

† Maximum credit allowed for campus and field workshop is twelve hours. Prior to Summer Quarter, 1951, the courses were given under the numbers 625 and 626.

† Not given during the academic year, 1954-1955.

ELECTRICAL ENGINEERING

Office, 102 Electrical Engineering Building

PROFESSORS DREESE, AYRES, BOONE, KIMBERLY, KRAUS, AND TANG, ASSOCIATE PROFESSORS HIGGY, KIRSCHBAUM, MUELLER, RUMSEY, WARREN, AND WEIMER, ASSISTANT PROFESSORS DAVIS, TICE, AND WEBB, MR. COWAN, MR. NEUBAUER, MRS. PANAKAL, MR. SMITH

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

631. Alternating Current Circuits I. Three credit hours. One Quarter. Autumn and Winter. Three class hours and two calculation hours each week. Mr. Tang, Supervisor.

Bridge circuits; network theorems; coupled circuits; impedance transformation or matching; tuned coupled circuits.

Not open for graduate credit to students majoring in Electrical Engineering.

632. Alternating Current Circuits II. Three credit hours. One Quarter. Winter and Spring. Three class hours each week. General prerequisites must include Electrical Engineering 631. Mr. Weimer, Supervisor.

Transients; polyphase circuits; Fourier analysis.

Not open for graduate credit to students majoring in Electrical Engineering.

633. Alternating Current Circuits III. Three credit hours. One Quarter. Winter and Spring. Three class hours each week. General prerequisites must include Electrical Engineering 632. Mr. W. C. Davis, Supervisor.

The propagation of alternating currents over long lines, loading and electrical filters.

Not open for graduate credit to students majoring in Electrical Engineering.

634. Introduction to Non-Linear Circuits. Three credit hours. One Quarter. Winter and Spring. Three class hours each week. General prerequisites must include Electrical Engineering 636, 665, 666 and 670. Mr. Warren, Mr. Mueller, Supervisors.

Survey of non-linear impedances and their characteristics; methods of non-linear circuit analysis; applications to harmonic generation; modulation and demodulation and the limiting effects of non-linear elements.

Not open for graduate credit to students majoring in Electrical Engineering.

636. Circuit Theory of Electron Devices I. Three credit hours. One Quarter. Autumn and Spring. Three class hours and two calculation hours each week. General prerequisites must include Electrical Engineering 632 and 663. Mr. Boone, Supervisor.

Electronic circuit components (diodes, triodes, tetrodes, pentodes, gas filled tubes and phototubes); circuit theory of triodes; circuit theory of tetrodes and pentodes; audio and video amplifiers; feedback principles.

Not open for graduate credit to students majoring in Electrical Engineering.

637. Circuit Theory of Electron Devices II. Three credit hours. One Quarter. Autumn and Winter. Three class hours each week. General prerequisites must include Electrical Engineering 636 and 666. Mr. Boone, Supervisor.

Gas control tube circuits; single-phase rectifiers and power supplies; polyphase rectifier circuits; radio frequency amplifiers and oscillators; circuit theory of transistors.

Not open for graduate credit to students majoring in Electrical Engineering.

638. Electric and Magnetic Fields. Three credit hours. Spring Quarter. Three class hours each week. General prerequisites must include Electrical Engineering 632 and Mathematics 609. Concurrent, Mathematics 610. Mr. Kraus, Supervisor.

Electrostatic fields; electric fields in simple geometries; electric current; magnetostatic fields; magnetic fields of simple geometries; introduction to electromagnetic theory and Maxwell's equations.

Not open for graduate credit to students majoring in Electrical Engineering.

662. Circuits Laboratory I. Two credit hours. One Quarter. Autumn and Winter. One class hour and one three-hour laboratory period each week. Concurrent, Electrical Engineering 631. Mr. Weed, Supervisor.

Electrical laboratory measuring instruments and their range of application; circuit measurements of resistance, reactance, and phase angle over the audio frequency range; resonance and loci; network theorems; and a-c bridges.

Not open for graduate credit to students majoring in Electrical Engineering.

663. Circuits Laboratory II. Two credit hours. One Quarter. Winter and Spring. One class hour and one three-hour laboratory period each week. General prerequisites must include Electrical Engineering 662 and 631. Concurrent, Electrical Engineering 632. Mr. Weed, Supervisor.

Coupled circuits; impedance matching; three-phase circuits and power measurements; non-sinusoidal waves; and transients.

Not open for graduate credit to students majoring in Electrical Engineering.

664. Circuits Laboratory III. Two credit hours. One Quarter. Winter and Spring. One class hour and one three-hour laboratory period each week. General prerequisites must include Electrical Engineering 636 and 666. Concurrent, Electrical Engineering 633. Mr. Davis, Supervisor.

Line parameters; attenuation of voltage and current on a d-c line; magnitude and phase of voltage and current on an open-wire line; reflected waves on line; coaxial line characteristics; filters.

Not open for graduate credit to students majoring in Electrical Engineering.

665. Non-Linear Circuits Laboratory. Two credit hours. One Quarter. Autumn and Winter. One class hour and one three-hour laboratory period each week. General prerequisites must include Electrical Engineering 632 and 663. Concurrent, Electrical Engineering 637, 667. Mr. Mueller, Mr. Warren, Supervisors.

Laboratory study of the characteristics of non-linear impedances; circuit applications of non-linear impedances.

Not open for graduate credit to students majoring in Electrical Engineering.

666. Electronics Laboratory I. Two credit hours. One Quarter. Autumn and Spring. One class hour and one three-hour laboratory period each week. General prerequisites must include Electrical Engineering 632 and 663. Concurrent, Electrical Engineering 636.

Characteristics of electronic components; audio frequency amplifiers; Class A radio frequency amplifiers; feedback circuits.

Not open for graduate credit to students majoring in Electrical Engineering.

667. Electronics Laboratory II. Two credit hours. One Quarter. Autumn and Winter. One class hour and one three-hour laboratory period each week. General prerequisites must include Electrical Engineering 636 and 666. Concurrent, Electrical Engineering 637. Mr. Davis, Supervisor.

The characteristics of gas-filled electron tubes; single phase power supplies; voltage regulators; inverters; polyphase rectifiers.

Not open for graduate credit to students majoring in Electrical Engineering.

670. Analysis of Electrical Engineering Problems. Three credit hours. One Quarter. Autumn and Winter. Three class hours each week. General prerequisites must include Electrical Engineering 632 and Mathematics 610. Mr. Warren.

The content will be selected from the following fields: differential equations, Heavyside operators. The applications will be illustrated by examples from electrical engineering and related fields. Electrical circuit analogies.

Not open for graduate credit to students majoring in Electrical Engineering. Not open to students who have credit for Electrical Engineering 770.

707. Advanced Circuits. Three credit hours. Autumn Quarter. Three class hours each week. General prerequisites must include Electrical Engineering 633, 637 and 664. Mr. Boone and Mr. Mueller, Supervisors.

Advanced electric circuit theory including impedance transformation; Foster's Reactance Theorem and applications; filters; and equalizers.

709. Advanced Circuits Laboratory. Two credit hours. Autumn Quarter. One class hour and one three-hour laboratory period each week. General prerequisites must include Electrical Engineering 633 and 664. Concurrent, Electrical Engineering 707. Mr. Mueller, Supervisor.

Techniques of radio frequency measurements; application of filters; impedance transformers and equalizers to communication systems.

713. Advanced Electric Machinery Theory. Four credit hours. Autumn Quarter. Four class hours each week. General prerequisites must include Electrical Engineering 752. Mr. Kirschbaum.

An analysis of the various revolving fields in electrical machinery; fractional slot windings; synchronous and asynchronous cusps; noise and vibration; composite machines, revolving permeances; skin effect.

714. Electron Tube Theory and Application. Three credit hours. Autumn Quarter. Three class hours each week. General prerequisites must include Electrical Engineering 637, 638, and Mathematics 610. Mr. Boone, Supervisor.

Electric fields, potential distribution, space charge flow, and energy relations in electron tubes; gaseous and variable conductors, transistor electronics.

718. Radiation from Antennas. Three credit hours. Spring Quarter. Three class hours each week. General prerequisites must include Electrical Engineering 638, 633, and 664. Mr. Kraus, Supervisor.

Circuit theory and electromagnetic theory of antennas; impedance concept applied to antennas; radiation resistance; antenna types and arrays; propagation.

719. Antenna Laboratory. Two credit hours. Spring Quarter. One class hour and one three-hour laboratory period each week. Concurrent, Electrical Engineering 718. Mr. Kraus, Supervisor.

Techniques of measurements at high frequencies; measurement of current distributions, radiation patterns and terminal impedances.

724. Microwave Circuits Laboratory. Two credit hours. Autumn Quarter. One lecture hour and one three-hour laboratory period each week. General prerequisites must include Electrical Engineering 633, 638, and 664. Concurrent, Electrical Engineering 739. Mr. Kraus, Mr. Mueller, Supervisors.

Measurement of impedance, power, and field intensity and distribution in wave-guide and transmission lines.

728. Elements of Industrial Electronics. Three credit hours. Spring Quarter. Three class hours each week. General prerequisites must include Electrical Engineering 637, 667, and 753. Mr. Weed, Supervisor.

Fundamentals of industrial electronic control using photocells, gas tubes, and ignitrons; timing circuits, trigger circuits, and sequence relaying; welder control; radio frequency heating.

733. Servomechanisms. Three credit hours. Autumn Quarter. Three class hours each week. General prerequisites must include Electrical Engineering 636, 751, and 670 and Mathematics 608 or their equivalent. Mr. Weimer, Supervisor.

The fundamental servomechanism control system; electrical and mechanical components; transient analysis of servomechanism systems with proportional, derivative and integral controllers; introduction to transfer-function analysis.

734. Servomechanisms Laboratory. Two credit hours. Autumn Quarter. One class hour and one three-hour laboratory period each week. General prerequisites must include Electrical Engineering 666 and 753. Concurrent, Electrical Engineering 733. Mr. Weimer, Supervisor.

Laboratory study of servomechanism equipment.

738. Control and Industrial Electronic Equipment. Three credit hours. Winter Quarter. Three class hours each week. General prerequisites must include Electrical Engineering 637, 667, 733, and 753. Mr. Weed, Supervisor.

Voltage regulators; ac-dc motor drives; industrial X-ray circuits; crystal rectifiers; copper-oxide and selenium rectifiers and applications.

739. Microwave Circuits. Three credit hours. Autumn Quarter. Three class hours each week. General prerequisites must include Electrical Engineering 633, 638, and 664. Concurrent, Electrical Engineering 724. Mr. Kraus, Mr. Mueller, Supervisors.

Wave guides and transmission lines; generation and detection of microwaves; measurement of impedance, power, and fields; special techniques.

741. Economics and Organization of the Electrical Industry. Four credit hours. One Quarter. Winter and Spring. Four class hours each week. General prerequisites must include Electrical Engineering 632 or 643. Mr. Ayres, Supervisor.

Principles of engineering economy and financial analysis applied to electrical industry in its principal divisions: power supply, communications, manufacturing and merchandising.

Not open for graduate credit to students majoring in Electrical Engineering.

743. Communication Theory. Three credit hours. Winter Quarter. Three class hours each week. General prerequisites must include Electrical Engineering 634, 637, 665, 667, and 707. Mr. Mueller, Supervisor.

Theory of communication, information content, frequency spectra, noise, methods of modulators and demodulators.

744. Communications Laboratory I. Two credit hours. Winter Quarter. One class hour and one three-hour laboratory period each week. General prerequisites must include Electrical Engineering 634, 637, 665, 667, 707, and 709. Concurrent, Electrical Engineering 743. Mr. Mueller, Supervisor.

Theory and laboratory study of non-linear amplifiers and oscillators; modulators.

747. Communications Systems. Three credit hours. Spring Quarter. Three class hours each week. General prerequisites must include Electrical Engineering 707 and 743. Mr. Mueller, Supervisor.

A study of the synthesis of amplitude and frequency modulated communication systems, with emphasis on transmitters and receivers.

748. Communications Laboratory II. Two credit hours. Spring Quarter. One class hour and one three-hour laboratory period each week. General prerequisites must include Electrical Engineering 707, 709, and 744. Concurrent, Electrical Engineering 747. Mr. Mueller, Supervisor.

Laboratory study of transmitters and receivers.

750. Electrical Machinery Theory. Four credit hours. One Quarter. Autumn and Winter. Four class hours and two calculation hours each week. General prerequisites must include Electrical Engineering 631, 632, 662, and 663. Mr. Dreese.

Theory of transformers and electrical machines of direct current and alternating current types.

Not open for graduate credit to students majoring in Electrical Engineering.

751. Electrical Machinery Theory. Four credit hours. One Quarter. Winter and Spring. Four class hours and two calculation periods each week. General prerequisites must include Electrical Engineering 750. Mr. Dreese.

A continuation of Electrical Engineering 750.

Not open for graduate credit to students majoring in Electrical Engineering.

752. Electrical Machinery Theory. Four credit hours. One Quarter. Autumn and Spring. Four class hours each week. General prerequisites must include Electrical Engineering 751. Mr. Dreese.

A continuation of Electrical Engineering 751.

Not open for graduate credit to students majoring in Electrical Engineering.

753. Electrical Machinery Laboratory. Two credit hours. One Quarter. Winter and Spring. One class hour and one three-hour laboratory period each week. General prerequisites must include Electrical Engineering 750. Mr. Kirschbaum.

Electrical machinery laboratory for Electrical Engineering 750.

Not open for graduate credit to students majoring in Electrical Engineering.

754. Electrical Machinery Laboratory. Two credit hours. One Quarter. Autumn and Spring. One class hour and one three-hour laboratory period each week. General prerequisites must include Electrical Engineering 751 and 753. Mr. Kirschbaum.

Electrical machinery laboratory for Electrical Engineering 751.

Not open for graduate credit to students majoring in Electrical Engineering.

755. Electrical Engineering Laboratory. Two credit hours. Autumn Quarter. One class hour and one three-hour laboratory period each week. General prerequisites must include Electrical Engineering 752 and 754. Mr. Kirschbaum.

Electrical machinery laboratory for Electrical Engineering 752.

Not open for graduate credit to students majoring in Electrical Engineering.

759. Industrial Electronics Laboratory. Two credit hours. Spring Quarter. One class hour and one three-hour laboratory period each week. Concurrent, Electrical Engineering 728. Mr. Weed, Supervisor.

Laboratory study of control circuits and power electronics applications.

760-761-762. Advanced Theoretical Study of Electrical Engineering Practice and Equipment. Credit hours to be arranged. Autumn, Winter, and Spring Quarters. General prerequisites must include permission of the instructor in charge. All instructors.

763. Circuit Theory of Transistors. Three credit hours. Winter Quarter. Three class hours each week. General prerequisites must include Electrical Engineering 634 and 667 or equivalent. Mr. Boone, Supervisor.

Circuit theory of the transistor in a variety of circuit applications, both linear and non-linear.

764. Transistor Circuits Laboratory. Two credit hours. Winter Quarter. One class hour and one three-hour laboratory period each week. General prerequisites must include Electrical Engineering 665 and 667. Concurrent, Electrical Engineering 763. Mr. Boone, Supervisor.

Laboratory study of the transistor in amplifier, oscillator, and switching circuit applications.

765-766-767. Special Advanced Laboratory. Credit hours to be arranged. Autumn, Winter, and Spring Quarters. General prerequisites must include a beginning course in Electrical Engineering and the consent of the instructor in charge. All instructors.

771. Theory of Small Motors. Four credit hours. Winter Quarter. Four class hours each week. General prerequisites must include Electrical Engineering 751. Mr. Tang, Supervisor.

The study of the theory and application of small motors. Methods of analyzing the performance of single-phase motors.

777. Theory of Alternating Current Equipment. Four credit hours. Spring Quarter. Four class hours each week. General prerequisites must include Electrical Engineering 751 and 754 or permission of instructor. Mr. Tang, Supervisor.

The study of three-phase transformers; three-phase induction motors in concatenation; the ACA or brush-shifting motor; methods of varying the speed of alternating current machines; amplidyne; rototrol; selsyns; short circuits on electrical systems and equipment.

778. Laboratory Study of Alternating Current Equipment. Two credit hours. Spring Quarter. One class hour and three laboratory hours each week. General prerequisites must include Electrical Engineering 771 or permission of instructor. Concurrent, Electrical Engineering 777. Mr. Tang, Supervisor.

The laboratory study of three-phase transformers, small motors, methods of varying the speed of alternating current machines, short circuits on electrical equipment, amplidyne and other power amplifiers.

780. Engineering Industrial Problems. Three credit hours. Spring Quarter. Three class hours each week. General prerequisites must include Electrical Engineering 750 or 643. Mr. Kimberly, Supervisor.

Layout of electrical distribution systems for factories and municipalities, electrolysis investigation, special cases of electric drive and control, power plant economics, and engineering aspects of patents.

781. Vacuum Tube Circuits. Three credit hours. Spring Quarter. Three class hours each week. General prerequisites must include Electrical Engineering 634, 637, 665, and 667. Mr. Davis, Supervisor.

Integrating and differentiating circuits; counting circuits; timing circuits; pulse circuits; wave-forming and wave-shaping circuits.

782. Vacuum Tube Circuits Laboratory. Two credit hours. Spring Quarter. One class hour and one three-hour laboratory period each week. General prerequisites must include Electrical Engineering 634, 637, 665, and 667. Concurrent, Electrical Engineering 781. Mr. Davis, Supervisor.

Laboratory study of integrating and differentiating circuits; counting circuits, timing circuits, pulse circuits; wave-forming and wave-shaping circuits.

790. Introduction to Electric Power Systems. Three credit hours. Autumn Quarter. Three class hours each week. General prerequisites must include Electrical Engineering 633, 752, and 754. Mr. Ayres, Mr. Warren, Supervisors.

Fundamentals of power system engineering including calculation of fundamental constants of transmission lines and electrical apparatus short circuit calculations, system stability, relaying, lightning and distribution.

791. High Voltage Laboratory. Two credit hours. Autumn Quarter. One class hour and one three-hour laboratory period each week. General prerequisites must include Electrical Engineering 638 and 751. Concurrent, Electrical Engineering 790. Mr. Ayres, Supervisor.

A laboratory study of high voltage insulation.

792. Introduction to Electric Power Systems. Three credit hours. Winter Quarter. Three class hours each week. General prerequisites must include Electrical Engineering 790. Mr. Ayres, Mr. Kirschbaum, Supervisors.

Continuation of Electrical Engineering 790.

793. Power Systems Laboratory. Two credit hours. Winter Quarter. One class hour and one three-hour laboratory period each week. General prerequisites must include Electrical Engineering 755. Concurrent, Electrical Engineering 792. Mr. Ayres, Mr. Kirschbaum, Supervisors.

A laboratory study of alternating current apparatus with respect to its application in Electric Power Systems.

794. Introduction to Electric Power Systems. Four credit hours. Spring Quarter. Four class hours each week. General prerequisites must include Electrical Engineering 792 and 793. Mr. Ayres, Mr. Warren, Supervisors.

Continuation of Electrical Engineering 792.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

These prerequisites include foundation courses in mathematics, physics and electrical measurements.

The general prerequisites include for 821 and 824, Electrical Engineering 750, 751, 752, or equivalent.

Graduate work will be given to individual students and groups under the course numbers given below. The following are the fields of special interest of the instructors listed. Other lines of study, are, however, taken up under their supervision. Mr. Drees, Electrical Machinery. Mr. Ayres, Mr. Warren, and Mr. Kirschbaum, Power Systems. Mr. Warren, Electrical Circuits. Mr. Kraus, Mr. Mueller, Mr. Rumsey, Electrical Communication and Radiation. Mr. Kimberly, Electrical Instruments, Alternating Current Apparatus. Mr. Tang, Alternating Current Apparatus, Small Motors. Mr. Boone, Electronics, Electron Tubes. Mr. Weimer, Servo-Mechanism. Mr. Weed, Industrial Electronics. Mr. Mueller, Electronic Optics, Betatron Studies.

801-802-803. Advanced Theoretical Study of Electrical Engineering Practice and Equipment. Credit hours to be arranged. Autumn, Winter, and Spring Quarters.

805-806-807. Advanced Laboratory Study of Electrical Engineering Equipment. Credit hours to be arranged. Autumn, Winter, and Spring Quarters.

808. Advanced Study of Small Motors. Four credit hours. Autumn Quarter. Four class hours each week. General prerequisites must include Electrical Engineering 752 and 754. Mr. Tang.

The study of the double revolving field theory, the cross-field theory, and the symmetrical-component method of analyzing the performance of single-phase motors. The determination of machine constants for these motors.

815. Transients in Linear Systems. Three credit hours. Autumn Quarter. Three class hours each week. General prerequisites must include Electrical Engineering 636, Concurrent Mathematics 601 or equivalent. Mr. Warren, Mr. Weimer.

Modern methods of solution of transient phenomena in electrical, mechanical, and thermal linear systems involving lumped and distributed parameters.

817. Advanced Theory of Antenna Systems I. Three credit hours. Autumn Quarter. Three class hours each week. General prerequisites must include Electrical Engineering 832 or equivalent. Mr. Rumsey.

Application of modern theory to antenna design. Reduction of the vector problem to a scalar problem. Representation of a field in terms of plane, spherical, or cylindrical waves. Applications to waveguides of arbitrary cross section and antennas of arbitrary shape. Scattering of radio waves.

818. Advanced Theory of Antenna Systems II. Three credit hours. Winter Quarter. Three class hours each week. General prerequisites must include Electrical Engineering 817. Mr. Rumsey.

Application of integral equations to antenna problems by the Green's function technique and Schelkunoff's equivalence principle. Babinet's principle. Approximate solution by the variational technique and exact solution by the Wiener-Hopf method. Radiation from open waveguides, traveling wave slots, echo area of flat plates, equivalent circuits for waveguide structures.

821. Revolving Fields and Permeances in Electrical Machinery. Three credit hours. Winter Quarter. Three class hours each week. Mr. Dreese.

An analysis of the various revolving and stationary fields found in electrical machinery. The origin and effects of both useful and parasitic fluxes are considered. Discontinuities and cusps in speed-torque curves of induction machines, asynchronous-motor effects in induction machines, sub-synchronous speeds in induction and synchronous machines.

824. Advanced Alternating-Current Machinery. Four credit hours. Winter Quarter. Four class hours each week. General prerequisites must include Electrical Engineering 752 and 754. Mr. Tang.

Advanced study of synchronous and induction machines; consideration of balanced and unbalanced operations, of steady-state and transient conditions. The two-reactance theory and symmetrical components will be used.

825. Advanced Alternating-Current Machinery. Four credit hours. Spring Quarter. Four class hours each week. General prerequisites must include Electrical Engineering 824. Mr. Tang.

Continuation of Electrical Engineering 824.

831. Network Analysis and Synthesis. Three credit hours. Winter Quarter. Three class hours each week. General prerequisites must include Electrical Engineering 815. Mr. Warren.

Theory and application of the Fourier Integral Theorem to the analysis of electrical networks. Synthesis of general two terminal and four terminal networks with applications.

832. Fundamentals of Electromagnetic Theory. Three credit hours. Autumn Quarter. Three class hours each week. General prerequisites must include Electrical Engineering 638 or equivalent. Mr. Kraus.

Maxwell's equations, scalar, vector and Hertzian potentials, dielectrics and conductors, plane waves in dielectric and conducting media, impedance of media, traveling and standing waves, energy flow, group velocity, phase velocity, depth of penetration, elliptical polarization and elliptical crossfield.

***833. Electro-Mechanical Systems.** Three credit hours. Spring Quarter. Three class hours each week. General prerequisites must include Electrical Engineering 815. Mr. Warren.

Application of the methods of electric circuit analysis to mechanical, acoustical, electro-mechanical, and electro-acoustical systems.

834. Analysis of Non-Linear Systems. Three credit hours. Winter Quarter. Three class hours each week. General prerequisites must include Electrical Engineering 637 and 815. Mr. Warren.

An advanced study of methods of analysis for non-linear systems with applications in the field of electric circuit theory.

835. Symmetrical Components. Three credit hours. Autumn Quarter. Three class hours each week. General prerequisites must include Electrical Engineering 633 and 752. Mr. Ayres, Mr. Kirschbaum.

Theory and application of symmetrical components to the analysis of power-system networks. A detailed study of sequence constants of transmission circuits and other electrical apparatus. The use of sequence networks in the calculation of unbalanced faults on power networks. Applications to problems of system grounding, relaying, and unbalanced operation of electrical apparatus.

***836. Symmetrical Components.** Three credit hours. Winter Quarter. Three class hours each week. General prerequisites must include Electrical Engineering 835. Mr. Ayres, Mr. Kirschbaum.

A continuation of Electrical Engineering 835.

837. Electric Power-System Analysis. Three credit hours. Winter Quarter. Three class hours each week. General prerequisites must include Electrical Engineering 835. Mr. Warren.

Steady state solution of power networks, power flow and regulating transformers. Theory and application of circle diagrams. Transient performance of rotating machines during balanced and unbalanced operation. Calculation of circuit-breaker interrupting duty. Steady state and transient stability of power systems, high-speed relaying, rapid reclosing and single-pole reclosing, high-speed excitation.

838. Electric Power-System Analysis. Three credit hours. Spring Quarter. Three class hours each week. General prerequisites must include Electrical Engineering 837. Mr. Warren.

A continuation of Electrical Engineering 837.

***840. Power System Economics.** Four credit hours. Spring Quarter. Four class hours each week. General prerequisites must include Electrical Engineering 792 and 741. Mr. Ayres.

Economic selection and location of stations and equipment, economic loading of machines. Distribution system layout and design. Substation economics and design.

841. Electron-Tube Theory and Design. Three credit hours. Autumn Quarter. Three class hours each week. General prerequisites must include Electrical Engineering 637 or permission of the instructor. Mr. Boone.

Analysis of the potential distribution in electron tubes, tube parameters as determined by electrode geometry; design methods to provide specific performance; electronic analysis of electron tubes including electron inertia effects.

842. Geometrical Electron Optics. Three credit hours. Winter Quarter. Three class hours each week. General prerequisites must include Electrical Engineering 714, Mathematics 610 or 661, or permission of the instructor. Mr. Mueller.

A study of electron optical systems, including the theory of aberrations, of deflecting systems and of dense electron beams.

* Not given in 1954-1955.

844. Theory and Survey of Variable Conductors. Three credit hours. Spring Quarter. Three class hours each week. General prerequisites must include Electrical Engineering 841. Mr. Boone.

A generalized study of the theory of variable conductors such as high-vacuum tubes, gaseous conductors and transistors.

845. Vacuum-Tube Electronics at High-Frequencies. Three credit hours. Winter Quarter. Three class hours each week. General prerequisites must include Electrical Engineering 841. Mr. Boone.

Network representation of the electron tube as determined by frequency; application of linear four-pole theory to small signal and noise analysis; velocity variation tubes.

846. Microwave Tubes. Three credit hours. Spring Quarter. Three class hours each week. General prerequisites must include Electrical Engineering 845. Mr. Boone.

A study of means of generation of microwave power.

847. Theory and Design of Servomechanisms. Three credit hours. Winter Quarter. Three class hours each week. General prerequisites must include Electrical Engineering 815 or permission of the instructor. Mr. Weimer.

Review of fundamental servo systems and components; application of transfer function analysis and development of stability criteria; design of linear lead and lag compensators; carrier systems.

848. Synthesis of Linear Servomechanisms. Three credit hours. Spring Quarter. Three class hours each week. General prerequisites must include Electrical Engineering 815 and 847. Mr. Weimer.

Logarithmic plots of transfer functions; multiple-loop and multiple-input systems; root loci; relation between time and frequency response; sampling servos; statistical properties of noise and servo inputs.

850. Wave Guides and Resonators. Three credit hours. Winter Quarter. Three class hours each week. General prerequisites must include Electrical Engineering 832. Mr. Kraus.

Parallel plane wave-guides, rectangular and cylindrical wave-guides, transmission line theory, resonators, discontinuities in wave-guide and transmission lines.

851. Radiation and Radiating Systems. Three credit hours. Spring Quarter. Three class hours each week. General prerequisites must include Electrical Engineering 832. Mr. Kraus.

Point source theory; arrays of point sources; the antenna as an aperture; the electric dipole and linear antennas; loop antennas; helical antennas; Schelkunoff's biconical antenna; cylindrical antennas and Hallen's integral equation; mutual impedance; slot horn, and complementary antennas; reflectors; lens antennas; microwave optics.

***852. Propagation of Electromagnetic Waves.** Three credit hours. Spring Quarter. Three class hours each week. General prerequisites must include Electrical Engineering 851. Mr. Kraus.

Diffraction, reflection, and refraction of waves, antenna over a plane earth, antenna over a spherical earth, propagation in an ionized medium.

950. Research in Electrical Engineering. Autumn, Winter, and Spring Quarters. All instructors.

NOTE: Detailed schedules of graduate studies available under the above course number may be obtained on application to the Department of Electrical Engineering.

Courses carrying this number involve a research problem selected by the student in consultation with his adviser.

* Not given in 1954-1955.

ENGINEERING DRAWING

Office, 218 Brown Hall

PROFESSOR PAFFENBARGER, ASSISTANT PROFESSOR KEARNS

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

704. Chemical Plant Layout and Design. Four credit hours. Spring Quarter. Two class hours and six laboratory hours each week. Mr. Paffenbarger.

Sketching and preliminary layout of industrial chemical plants. Design and drawing of a complete plant for the manufacture of a chemical or related product.

710. Advanced Graphics. Three credit hours. Winter Quarter. One lecture and three two-hour laboratory periods each week. Mr. Kearns.

Methods of graphical presentation and calculation. Types of applications of charts. Graphical differentiation and integration. Anamorphosis of curves. Nomography.

NOTE: TEACHING COURSES. For the Teaching Courses in this department see the Department of Education, Courses 697 and 698.

ENGINEERING EXPERIMENT STATION

The Engineering Experiment Station is a division of the College of Engineering and was established by law to conduct technical research. The Station is authorized to cooperate with divisions of the State and National governments and with private individuals and corporations.

In many cases the Station investigations are such as may properly be conducted by graduate fellows working under direction of members of the faculty or Station staff. It follows, therefore, that not infrequently candidates for graduate degrees work out their theses or dissertations utilizing the equipment of the Station.

ENGINEERING MECHANICS

Office, 208 Industrial Engineering Building

PROFESSORS OTT, FOLK, AND POWELL, ASSOCIATE PROFESSORS CLARK AND WEST, ASSISTANT PROFESSORS TUCKER, AND GRAHAM, MR. NIEDENFUHR

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

These prerequisites include acceptable courses in differential and integral calculus and physics.

601. Statics. Five credit hours. One Quarter. Autumn, Winter, Spring. Five recitations each week. Mr. Ott and others.

Resultant and equilibrium of concurrent and noncurrent coplanar force systems by algebraical and graphical methods; connected bodies; simple trusses; frames involving three-force members; flexible cables; friction; equilibrium of noncurrent noncoplanar force systems; center of gravity and moment of inertia of masses and plane areas by integral calculus.

602. Strength of Materials. Five credit hours. One Quarter. Autumn, Winter, Spring. Four recitations and one two-hour laboratory period each week. General prerequisites must include a course in statics. Mr. Folk and others.

Tensile, compressive and shearing stresses and deformations; allowable working stresses; combined stress by Mohr's Circle; stresses beyond the elastic limit; analysis of axial force on riveted and welded joints; torsion; bending and longitudinal shearing stresses and deformations in beams; deflection of beams by double integration; column theory and analysis of working column formulas.

605. Strength of Materials. Three credit hours. One Quarter. Autumn, Winter, Spring. Three recitations each week. General prerequisites must include Mechanics 602. Mr. Folk and others.

Use of Mohr's Circle in three dimensions; theories of failure of elastic action, resilience in bending and torsion; deflection by area moments; statically indeterminate and tapered beams; lateral and web buckling of beams; energy of bending and shear.

607. Dynamics. Three credit hours. One Quarter. Autumn, Winter, Spring. Three recitations each week. General prerequisites must include a course in statics. Mr. Ott and others.

Dynamics of linear and angular motion from constant forces and forces proportional to displacement; connected bodies; impulse and momentum; combined rotation and translation; work energy, and power; rotating and accelerated frames of reference.

Not open to students who have credit for Mechanics 617.

610. Mechanics of Fluids. Three credit hours. One Quarter. Autumn, Winter, Spring. Three recitations each week. General prerequisites must include a course in statics. Mr. Powell and others.

Fluid pressure including stability of simple gravity dams; fundamentals of fluid flow including orifices, weirs, nozzles, venturis, and vortices; pressure of deviated flow; fluid friction; non-turbulent flow in pipes, and steady turbulent flow in pipes and uniform open channels; effect of viscosity hydraulic models.

703. Experimental Stress Analysis. Two credit hours. Spring Quarter. Four hours of laboratory each week. General prerequisites must include Mechanics 605. Mr. Clark.

Laboratory experiments involving the use of electric strain gages, "stress-coat," brittle models, and photoelastic analysis of welded and other structures; determination of fatigue limits.

705. Theory of Limit Design. Three credit hours. Autumn Quarter. Three recitations each week. General prerequisites must include Mechanics 605. Mr. Ott.

Basic assumptions of limit design. Stress redistribution after elastic failure. Residual stresses. Simple and redundant structures. Ductile columns. Experimental values.

706. Mechanics of Earth Action. Three credit hours. Autumn Quarter. Three lectures or recitations each week. General prerequisites must include Mechanics 602. Mr. Tucker.

Study of methods and results of field and laboratory tests. Theoretical analysis of the forces exerted by earth on structures, and the distribution of forces in loaded soils as applied to engineering. Historical evolution of the subject.

707. Mechanical Vibrations. Three credit hours. One Quarter. Winter and Spring. Three recitations each week. General prerequisites must include Mechanics 607. Mr. Ott, Mr. West.

Acceleration, velocity and displacement from variable forces. Vibration, free and forced. Torsional vibration. Dynamic balance. Vibration and whipping of shafts.

710. Mechanics of Fluids. Three credit hours. Winter Quarter. Three recitations each week. General prerequisites must include Mechanics 610 or Mechanical Engineering 602, or equivalent. Mr. Powell.

A continuation of subject matter of Mechanics 610, including such subjects as stability of flotation; discharge under variable head; unsteady flow in pipes; non-uniform flow in open channels; and the elements of dimensional analysis and dynamic similarity as applied to model testing.

713. Advanced Strength of Materials I. Three credit hours. Autumn Quarter. Three lectures or recitations each week. General prerequisites must include Mechanics 605 or Aeronautical Engineering 611, and also Mathematics 602 or 608 or 611. Mr. Folk.

Stress concentration, and fatigue; Mohr's Circle for strains; general relationships of stresses and strains at a point, theories of failure of elastic action; analysis of stresses and strains in flat plates; torsion of noncircular sections including structural shapes and thin hollow cells; membrane analogy, curved beams and hooks.

714. Advanced Strength of Materials II. Three credit hours. Winter

Quarter. Three lectures or recitations each week. General prerequisites must include Mechanics 605 or Aeronautical Engineering 611, and also Mathematics 602 or 608 or 611. Mr. Folk.

Limitations of flexure formula; bending stresses in nonsymmetrical sections; lateral shear; thick cylinders; elastic energy of bending and shear; Castigliano's theorem, deformations beyond the elastic limit.

715. Advanced Strength of Materials III. Three credit hours. Spring Quarter. Three lectures each week. General prerequisites must include Mechanics 605 or Aeronautical Engineering 611 and also Mathematics 602, or 608, or 611. Mr. Folk.

Special problems in bending of beams including beams on elastic foundation; beams with direct compression; effective width of thin beam flanges; buckling of bars and shells; deflection curves by trigonometric series.

799. Special Problems in Advanced Mechanics. Two to five credit hours. Autumn, Winter, and Spring Quarters. General prerequisites must include thirteen hours of 600 courses in Mechanics, and consent of the instructor. All instructors.

This course is intended to give the advanced student an opportunity to pursue special studies not offered in fixed curricula, in such topics as mechanics of earth action, photoelastic analysis, stress analysis by various types of models, balancing and other dynamic problems, advanced theoretical mechanics, and the study of hydraulic models. A student may repeat the course until he has a maximum of fifteen credit hours.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

801. Advanced Theoretical Mechanics. Three to eighteen credit hours. Autumn, Winter, and Spring Quarters. This course may be repeated to a total of eighteen credit hours. General prerequisites must include Mathematics 611 and Mechanics 605, 607 and 610 or equivalent in addition to evidence of sufficient background in the area of study chosen. All instructors.

Topics will be selected from the following:

(a) Advanced statics; (b) advanced dynamics; (c) hydrodynamics and fluid mechanics; (d) soil mechanics; (e) strength of materials; and (f) applied elasticity.

807. Advanced Theory of Vibrations. Three credit hours. Spring Quarter. General prerequisites must include Mechanics 605 and 607 and Mathematics 602 or 608 or 611. Mr. Ott.

Forced and free vibrations; accelerations and displacements from variable forces; damping; resonance; phase angles; negative damping.

813-814. Applied Elasticity. Three credit hours. Winter and Spring Quarters. General prerequisites must include Mechanics 605 and Mathematics 608 and 609 or the equivalent. Mr. West, Mr. Folk.

Experimental and theoretical bases of theory of elasticity; Hooke's Law; stress and strain in three dimensions; equations of equilibrium and compatibility; boundary values; special cases of plane stress, plane strain, and generalized plane stress; bending of beams and plates; thin and medium thin flat and curved plates; tubes, cylinders, and rollers; concentrated loads and the principles of St. Venant; general problem of torsion of prisms and other special cross sections; membrane analogy; Castigliano's and Maxwell's theorems; approximate methods.

816. Elastic Energy Theory. Three credit hours. Autumn Quarter. Three recitations each week. General prerequisites must include Mechanics 605 and one of the following: Civil Engineering 701, 711, 713, or Aeronautical Engineering 710. Mr. Clark.

The Elastic Energy concept applied to solutions for deformations and stresses in frames, beams, bents, rings, arches and columns, redundant beams and frames. Bending stresses combined with direct or torsional stresses. Deformation due to shear.

Not open to students who have credit for Mechanics 716.

950. Research in Mechanics. Autumn, Winter, and Spring Quarters.

ENGLISH

Office, 115 Derby Hall

PROFESSORS ESTRICH, FULLINGTON, BECK (EMERITUS), PERCIVAL (EMERITUS), WALLEY, WILSON, DERBY, CHARVAT, SIMPSON, HILDRETH, UTLEY, AND AL-TICK, ASSOCIATE PROFESSORS SNOW, HUGHEY, LOGAN, BLOOMFIELD, PEARCE, AND ELLIOTT, ASSISTANT PROFESSORS CRAIG (EMERITUS), DUMBLE, SNIFFEN (EMERITUS), WHITMER, ROBBINS, VARANDYAN, HABER, KANE, BLICKLE, AND TOWNSEND

General Information for Graduate Students:

(1) Graduate study in English requires an undergraduate major in English (i.e., not less than the equivalent of forty Quarter hours in advanced courses in English and related subjects, at least twenty-five of which must be in English). Students deficient in this respect must make up the deficiency by taking such extra or compensatory work as the Department advisers may deem necessary.

(2) Graduate students taking work leading toward the M.A. degree generally fall in one of two classifications: (a) those desiring to take further academic work possibly leading to the Ph.D. degree, and (b) those planning a professional career in secondary schools. It is expected that the course of study for the M.A. (academic) will differ from that for the M.A. (professional).

(3) The requirements for the M.A. (academic) are forty-five hours of English and related subjects. Concentration in a field of study is desirable and will be arranged with respect to the student's needs. The master's thesis should be of such nature as to demonstrate the candidate's ability to carry on research. The final examination will be limited to the candidate's major field of concentration, in which he will be expected to demonstrate a high degree of competence.

(4) The requirements for the M.A. (professional) are forty-five hours of English and related subjects so comprehensively planned that the candidate will have an adequate knowledge of (a) the history and development of the English language, (b) teaching methods in English, and (c) the chief figures and epochs of English and American Literature from Chaucer to the modern day. Ordinarily at least twenty-five hours of English will be required for this program, but special arrangements may be possible for the mature student whose undergraduate preparation has been unusually thorough, and who may need special work in other departments for the advancement of his professional career. The master's thesis on this program will be a critical or historical study of some aspect of a major figure or epoch in English or American literature. In the final examination the candidate will be expected to demonstrate a comprehensive knowledge of the main developments in the history of English and American language and literature, and to prove his competence as an interpreter and critic of literature.

(5) All graduate students working for the M.A. degree will be expected to consult regularly with the duly appointed Department advisers for that degree, and no program for such work will be accepted by the Department until it has been formally approved. Candidates for the M.A. degree will be expected to take their work in "600", "700", and "800" courses. Of these, at least 25 hours (including the thesis) must be on the "700" and "800" level. Before admission to candidacy, the student must have completed 30 hours of graduate work with a point-hour-ratio of 3.0 or better.

(6) The minimum requirements for the Ph.D. degree in English are (a) at least one full year (forty-five hours) of study after the completion of the M.A. (or its equivalent), (b) a thorough reading knowledge of one modern foreign language, and a working knowledge of one other language, ancient or modern (to be determined by the candidate's needs for his field of specialization), (c) the satisfactory passing of a written and oral examination for admission to candidacy, and (d) the submission of a satisfactory thesis. Candidates for the Ph.D. will be expected to take their work in the "700" and "800" courses. Courses on the "600" level may be taken for credit only by permission of the Chairman of the Graduate Committee.

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

609. The American Renaissance in Literature. Five credit hours. Autumn Quarter. Mr. Pearce.

An introduction to the major American writers of the mid-nineteenth century: Hawthorne, Melville, Emerson, Thoreau, Whitman. The readings in this course do not duplicate those in English 510.

610. American Fiction from Twain to Dreiser. Five credit hours. Winter Quarter. Mr. Charvat.

Studies in fiction from the Civil War to the First World War, with emphasis on Twain, Howells, James, the regionalists, the early naturalists and Dreiser. The readings in this course do not duplicate those in English 510.

615. Twentieth Century American Writers. Five credit hours. Spring Quarter. Mr. Pearce.

A study of the development of American literature after 1914 with emphasis on the major poets and novelists.

***618. Conflicting Ideas in Modern Literature.** Five credit hours. Winter Quarter.

A study of some of the major conflicting ideas as reflected in modern literature. The following authors will be studied: Bernanos, Gide, Huxley, James, Kafka, Lawrence, Malraux, Santayana, Silone.

Not open to students who have credit for Philosophy 618.

***620. Folklore.** Five credit hours. Mr. Utey.

A critical examination of some of the outstanding English and American folksongs and international folk tales. Lectures and class discussions will be supplemented by recordings.

To be offered in 1955-1956.

625. Standards of English Usage. Five credit hours. Autumn Quarter. Mr. Bloomfield.

This course examines standards of English grammar and pronunciation, the structure and vocabulary of English, and the idea of correctness in language. The approach throughout is functional rather than historical, to meet the needs of students interested in writing, teaching, the development of their own culture or the investigation of language generally.

***627. The Language We Speak.** Five credit hours. Winter Quarter. Given in alternate years. Mr. Bloomfield.

A study of the history of English, its words and structure and logic, its cultural patterns and philosophical significance, and its use as an instrument of communication.

635. The Age of Wit and Satire. Five credit hours. Winter Quarter. Mr. Wilson.

The skeptical and critical mind of the Early Enlightenment as reflected in lyric and satiric verse from Dryden to Pope; the comic wit of the Restoration, and the bitter wit of Swift.

636. Literature of the Eighteenth Century. Five credit hours. Autumn Quarter. Mr. Elliott.

A course in the major literary figures from Swift to Blake. Intensive reading in the work of such men as Swift, Pope, Fielding, Johnson, Blake, with supplementary reading in the work of their contemporaries.

641. The Romantic Temper. Five credit hours. One Quarter. Autumn and Spring. Mr. Logan, Mr. Townsend.

The influence of the French Revolution and the pre-eminence of the Romantic Ideal, as seen in such major poets as Wordsworth, Coleridge, Byron, Shelley, and Keats, and a limited selection of the prose of the period.

642. The Victorian Age. Five credit hours. One Quarter. Winter and Spring. Mr. Derby, Mr. Altick.

The spirit and temper of the Victorian period as seen in the work of such poets as Tennyson, Browning and Arnold, and in representative essays of the great social critics.

643. The Writing Laboratory. Five credit hours. Spring Quarter. Three group meetings each week and individual conferences. Permission of the instructor. Mr. Snow.

Directed writing in the shorter forms of fiction, in the essay, or in criticism, depending on the direction of the individual student's talent. Conferences and group discussions will provide guidance in the problems of writing. Six modern books will be read and discussed as examples of writing practice.

Speech 648. Playwriting. Five credit hours. Autumn Quarter. General prerequisites must include one of the following courses: English 676, 677, or 670. Mr. Sheddi.

Elementary laboratory course in playwriting. Methods of play analysis with attention to dramatic technique. An historical consideration of the major forms of drama.

653. Chaucer. Five credit hours. Spring Quarter. Mr. Bloomfield.

A close study of Chaucer's principal works and of the poet's development as artist in relation to his social and literary background.

Not open to students who have credit for English 753.

* Not given in 1954-1955.

654. Introduction to Medieval Literature. Five credit hours. Winter Quarter. Mr. Estrich.

The study of significant literary masterpieces from the Middle Ages, chosen for their value in interpreting aspects of medieval culture as well as for their independent literary worth.

656. The Nineteenth Century English Novel. Five credit hours. Winter Quarter. Mr. Logan.

Readings in a group of major novelists, such as Austen, Dickens, Thackeray, and others, with emphasis upon social and humanistic values.

670. Modern Drama. Five credit hours. Spring Quarter. Mr. Shedd.

An historical and critical examination of the major developments, personalities, and achievements in the drama of Europe and America since the advent of Ibsen.

671. Early Seventeenth Century Literature. Five credit hours. Autumn Quarter. Mr. Robbins.

A study of non-dramatic literature in England from 1600 to 1660, with chief emphasis on the work of Bacon, Jonson, Donne, Browne and Milton, viewed against their literary, social and historical background.

674. The English Renaissance. Five credit hours. Winter Quarter. Miss Hughey.

A study of Tudor prose and poetry as they reflect the creative and inquiring temper of an age stimulated by such cultural forces as humanism, the Reformation, great natural and technological discoveries, and increasing national self-consciousness.

676. Shakespeare. Five credit hours. Spring Quarter. Mr. Walley.

A critical consideration of the art, personality and achievement of Shakespeare in the light of Renaissance culture and modern significance.

677. English Drama: Medieval and Renaissance. Five credit hours. Autumn Quarter. Mr. Walley.

An historical and critical examination of English popular drama from its origin to the closing of the theaters in 1642, with special emphasis upon the evolution of dramatic concepts and theatrical art.

678. English Drama: Restoration and Eighteenth Century. Five credit hours. Winter Quarter. Mr. Wilson.

An historical and critical study of English drama from 1660 to 1800, with chief emphasis upon Restoration heroic drama and comedy of wit, eighteenth-century sentimental drama and the comedy of Sheridan and Goldsmith.

Not open to students with credit for English 669.

701. Minor Problems in English. One to five credit hours. Summer, Autumn, Winter, and Spring Quarters.

Students may register for individual directed study under this number by arrangement with the appropriate member of the staff and the Department Graduate Committee.

708. Studies in the American Renaissance. Five credit hours. Spring Quarter. Mr. Charvat.

An intensive study of the major Romantics—Poe, Hawthorne, Melville, Whitman, Emerson, Thoreau—in relation to the American environment and foreign influences. The course assumes that the student has an acquaintance with the basic writings of the period as developed in English 609.

709. Studies in American Fiction, 1865-1914. Five credit hours. Autumn Quarter. Mr. Simpson.

An intensive study of important fiction from Twain to Dreiser. The course assumes that the student has an acquaintance with the basic fiction of the period as developed in English 610.

710. Literature and the Methods of Intellectual History. Five credit hours. Winter Quarter. Mr. Pearce.

A study of the principal methods of intellectual history as they bear upon literary history and criticism.

Not open to students who have credit for English 601.

715. Studies in English or American Literature. Five credit hours. Autumn, Winter, and Spring Quarters.

Under this number, the Department may offer an intensive course on some phase of English or American literature when student needs justify it.

727. Twentieth Century Poetry. Five credit hours. Spring Quarter. Mr. Pearce.

A critical study of a representative body of modern poetry, with emphasis on selected major writers.

728. Twentieth Century Fiction. Five credit hours. Autumn Quarter. Acquaintance with French 640 and German 616 is recommended. Mr. Simpson.

A study of the chief tendencies in modern fiction as seen in the work of such major figures as Proust, Joyce, Mann, D. H. Lawrence, Virginia Woolf, Hemingway and Faulkner.

735. Dryden. Five credit hours. Spring Quarter. Mr. Wilson.

A detailed study of the poems, plays and essays of John Dryden, as exemplifying the principles and practices of the early Enlightenment.

***736. Pope.** Five credit hours. Winter Quarter. Given in alternate years. Mr. Elliott.

Intensive reading and investigation of Pope's work and its specifically literary value and its relation to the intellectual climate of Pope's day.

737. Swift. Five credit hours. Winter Quarter. Given in alternate years. Mr. Elliott.

An intensive critical study of Swift's work and of its relation to the intellectual and political movements of the Age of Reason.

738. Studies in the Eighteenth Century. Five credit hours. Spring Quarter.

An intensive examination of an important aspect of eighteenth century literature or thought. The topic will vary from year to year.

The topic for 1954-1955: The Eighteenth Century Novel.

742. Browning. Five credit hours. Spring Quarter. Mr. Altick.

An intensive study of most of Browning's significant poems, with primary emphasis upon the poet as a literary artist, but also considering in some detail his place in the history of Victorian thought, the nature of his popular appeal, and his influence upon later literature.

744. Arnold. Five credit hours. Winter Quarter. Given in alternate years. Mr. Derby.

Wide reading in the poetry and prose of Matthew Arnold, with a study of his background and his relation to both his own time and the twentieth century.

745. Wordsworth. Five credit hours. Autumn Quarter. Mr. Logan.

The social and political thought of Wordsworth's day, his position as the pivotal figure in the Romantic Movement, his philosophy of Man and Nature, and his place in literature as poet and thinker.

746. Middle English Literature. Five credit hours. Winter Quarter. Given in alternate years. Mr. Bloomfield.

A critical reading of the chief monuments of Middle English literature, exclusive of Chaucer. Cultural backgrounds will be supplied from related works in English and other languages, usually in translation. The language will be taught inductively and only as necessary to the reading of texts.

750. Master's Thesis. One to five credit hours. Autumn, Winter, and Spring Quarters. Staff.

751. Old English Poetry. Five credit hours. Autumn Quarter. Given in alternate years. Mr. Bloomfield.

A critical reading of Old English poetry with attention to problems of structure and texture. Cultural backgrounds will be supplied from contemporary prose, sometimes in translation. The language will be taught only as necessary to the reading of texts.

***755-*756. Linguistics and English.** Five credit hours each Quarter. Autumn and Winter Quarters. Given in alternate years. Mr. Utley.

An introduction to the characteristic problems and tools of linguistic science with reference

* Not given in 1954-1955.

to their use in the study and teaching of English language and literature. Topics to be studied are general linguistics, language and culture, phonetics and dialect geography, the history of English, problems in the teaching of English literature and language.

771. Donne and Other Metaphysical Poets. Five credit hours. Autumn Quarter. Given in alternate years. Mr. Wilson.

A close study of significant verse of the early Seventeenth Century, designed for graduate students and for undergraduates with a special interest in poetry.

***772. Studies in Renaissance Prose.** Five credit hours. Spring Quarter. Given in alternate years. Miss Hughey.

The evolution of literary prose from More to Milton as seen in representative works which are related critically to rhetorical theory and significant cultural forces. Emphasis is upon writers of the earlier seventeenth century.

***773. Spenser.** Five credit hours. Autumn Quarter. Given in alternate years. Miss Hughey.

A study of Spenser's poetry, its literary significance, and its relation to foreign, classical, and native English poetic traditions.

775. Milton. Five credit hours. Winter Quarter. Given in alternate years. Mr. Robbins.

Reading in the poetry and prose of John Milton, with relation to his social and literary background.

NOTE: TEACHING COURSES. For the Teaching Courses in this department see the Department of Education, Courses 670 and 671.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51. Enrollment in these courses requires the approval of the student's graduate adviser.

***835-*836. Classic and Romantic.** Five credit hours each Quarter. 835, Winter Quarter; 836, Spring Quarter. Given in alternate years.

A study of the classical ideal, critical and creative, of the early Eighteenth Century, followed by a study of the romantic ideal of the late Eighteenth and early Nineteenth Centuries.

***837-*838. Research in the Restoration Period.** Five credit hours each Quarter. 837, Winter Quarter; 838, Spring Quarter. Given in alternate years. Mr. Wilson.

Individual research in Restoration Literature, Dryden to Pope; oral and written reports.

***842-*843. Studies in Victorian Literature.** Five credit hours each Quarter. 842, Winter Quarter; 843, Spring Quarter. Given in alternate years. Mr. Altick.

Problems and researches in the great Victorians in the light of their religious, philosophical, and social backgrounds.

852-853. Studies in the Medieval Period. Five credit hours each Quarter. 852, Winter Quarter; 853, Spring Quarter. Given in alternate years. Mr. Utley.

Problems in the literature of the medieval period.

865-866. Studies in American Literature and Cultural History. Five credit hours each Quarter. 865, Autumn Quarter; 866, Winter Quarter. Mr. Charvat.

Individual research in problems in American literature.

875-876. Studies in the Age of Shakespeare. Five credit hours each Quarter. 875, Winter Quarter; 876, Spring Quarter. Given in alternate years. Mr. Walley.

A study of the problems and materials of scholarship relating to Shakespeare and his theatrical and cultural environment. Individual research.

* Not given in 1954-1955.

880. Bibliography and Method. Five credit hours. Autumn Quarter. Mr. Altick.

A course for the advanced graduate student in the methods and tools of documentary research.

881. Textual Criticism and Editing. Five credit hours. Spring Quarter. Given in alternate years. General prerequisites must include English 880. Miss Hughey.

Methods employed by representative scholarly editors of English literature; evaluation of selected editions; training in the skills requisite to the scholarly editor; paleography, usage of early printed books, collation, annotation; practices in textual editing.

950. Research in English. Autumn, Winter, and Spring Quarters.

This course is to be used only for dissertation registration of candidates for the degree of Doctor of Philosophy. The candidate should consult the adviser in charge of his major.

PUBLIC SPEAKING

(See Speech)

ENTOMOLOGY

(See Zoology and Entomology)

EUROPEAN HISTORY

(See History)

FARM CROPS

(See Agronomy)

FINE AND APPLIED ARTS

Office, 104 Hayes Hall

PROFESSORS SEIBERLING, ATHERTON, BOGATAY, FANNING, FREY, GRIMES, LITTLEFIELD, AND SHERMAN, ASSOCIATE PROFESSORS BARKAN, BRADLEY, CHADEAYNE, GATRELL, HOLMES, AND KING AND ASSISTANT PROFESSOR WOOD (ACTING DIRECTOR)

Admission and Degree Requirements: For requirements additional to those of the Graduate School see the Bulletin of the School of Fine and Applied Arts under Graduate Program.

Programs leading to the Ph.D. Degree in the History of Art, Painting, Sculpture, Ceramics or Art Education: These programs are planned individually in consultation with the graduate staff of the School. For additional graduate information see the Bulletin of the School of Fine and Applied Arts.

Programs leading to the M.A. Degree: The curricula that follow are suggestive only and are exclusive of the thesis, which is required in all cases. It is assumed that the graduate student is mature in his educational interests and will have acquired individual direction in his work. For additional information see the Bulletin of the School of Fine and Applied Arts.

SUGGESTED CURRICULA IN FINE ARTS

Leading to the M.A. Degree

ART EDUCATION

Fine Arts	(716) 5	Fine Arts	(702e) 5	Fine Arts	(721 or 810) 3
Fine Arts	(716) 5	Fine Arts	(802 studio) 5	Fine Arts	(718) 5
Fine Arts	(717) 5	Fine Arts	(811) 2-3	Fine Arts	(719) 5
		Education	(758 760, 678 or 748) 8	Fine Arts	(708 studio) 2

ART HISTORY

Fine Arts	(720) 2-3	Fine Arts	(802 studio) 5	Fine Arts	(812) 4
Fine Arts	(801a) 5	Fine Arts	(805a) 2	Fine Arts	(703 studio) 2
Fine Arts	(804a) 4	Philosophy	(701) 5	Fine Arts	(806a) 5
Education	(757, 810, or 607) 3	Fine Arts	(811) 3	Philosophy	(665) 3
				Fine Arts	(721 or 810) 3
				Fine Arts	(802a) 3

CERAMIC ART

Fine Arts	(701c) 2	Fine Arts	(815) 5	Fine Arts	(728) 5
Fine Arts	(720) 2-3	Fine Arts	(818) 5	Fine Arts	(814) 5
Fine Arts	(801c) 5	Philosophy	(701) 5	Fine Arts	(816) 3
Fine Arts	(722) 5	Fine Arts	(811) 3	Fine Arts	(721 or 810) 2

PAINTING

Fine Arts	(724) 5	Fine Arts	(817) 5	Fine Arts	(727) 5
Fine Arts	(720) 2-3	Fine Arts (643, 702a, or 662c)	5	Fine Arts	(728) 2
Fine Arts	(725) 5	Fine Arts	(805a) 5	Philosophy	(701) 5
Fine Arts	(701p) 2	Fine Arts	(702p) 2	Fine Arts	(721 or 810) 3
		Fine Arts	(811) 3		

SCULPTURE

Fine Arts	(728) 5	Fine Arts	(818) 5	Fine Arts	(819) 5
Fine Arts	(729) 5	Fine Arts (643, 662c, or 802p)	5	Fine Arts	(820) 2
Fine Arts	(701s) 2	Fine Arts	(811) 3	Philosophy	(701) 5
Fine Arts	(720) 2-3	Fine Arts	(802a) 2	Fine Arts	(721 or 810) 3

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

600. The Theory of Art Education. Five credit hours. Autumn Quarter. Five three-hour periods each week. Mr. Barkan.

Planning and organizing the art education program in the school. The practical problems and the theoretical possibilities. The resolution of the students' experience toward his responsibility in the field of Art Education.

625. Advanced Life Drawing. Five credit hours. One Quarter. Autumn, Winter, Spring. General prerequisites must include a course in drawing from life. Mr. Chadeayne, Mr. Gatrell, Mr. King.

Advanced problems in drawing from life and figure composition.

†630. Advanced Water Color Painting. Five credit hours. Mr. Chafetz.

Painting from still life, models, and landscapes. Special problems in organization and development of pictures. This course is particularly suited to graduate students who plan to present a thesis in water color painting.

643. Graphic Processes. Five credit hours. One Quarter. Autumn, Winter, Spring. Graduate students must have had fifteen Quarter hours of course work in drawing and painting. Mr. Gatrell.

This course will explore the possibilities in the processes of intaglio relief, and planographic modes of graphic reproduction. An opportunity for experimental and professional experience in the numerous forms of print making such as lithography, etching, silk screen, etc.

***645-*646-*647. Portrait Painting.** Five credit hours. Autumn, Winter, and Spring Quarters. General prerequisites must include Fine Arts 660. Five three-hour periods each week. Mr. Chadeayne, Mr. Gatrell, Mr. King.

Painting from life. The organization and development of pictures with special reference to the delineation of character.

650. Methods and Materials of the Painter. Three credit hours. Autumn Quarter. General prerequisites must include a course in advanced oil painting.

A study of painting materials, the composition of pigments, binders, and varnishes. A review of ancient methods of painting with a consideration of their possibilities for contemporary use. Egg tempera, varnish tempera, under-painting, and oil glazes. Laboratory practice and lectures.

654. History of Renaissance in Italy. Five credit hours. Winter Quarter. Five lectures each week. Mr. Fanning.

The study of the Renaissance movement in Italy as reflected in architecture, painting, and sculpture; its influence upon other countries and its relationship to the intellectual trend from the Fifteenth to the Nineteenth Century.

656. History in Oriental Art. Five credit hours. Autumn Quarter. Five lectures each week. Miss Holmes.

* Not given in 1954-1955.

† Not given during the academic year, 1954-1955.

The study of Asiatic culture expressed by the historical development of architecture, sculpture, and painting in Persia, India, China, and Japan. Illustrated lectures, reading, and reports.

661-662-663. Technical Problems. Two to five credit hours. The sum total of credit taken in these courses must not exceed forty-five hours. Autumn, Winter, and Spring Quarters. Open by permission of the department to students in technical fields who have completed the other laboratory courses in their areas and who wish an opportunity for further research in specialized problems. Miss Bradley, Mr. Fanning, Mr. Grimes, Mr. Sherman, Mr. Chadayne, Mr. Frey, Mr. Atherton, Mrs. Fetzner, Mr. Rannells, Mr. Bogatay, Mr. Barkan, Mr. Littlefield, Miss Holmes, Mr. Seiberling, Mr. Gatrell, Mr. King.

- | | |
|--------------------|----------------------------------|
| (a) History | (i) Interior Design |
| (b) Commercial Art | (j) Jewelry |
| (c) Ceramics | (k) Drawing |
| (d) Design | (m) Medical Art |
| (e) Art Education | (n) Oil and Water Color Painting |
| (f) Costume Design | (s) Sculpture |
| (g) Graphic Art | (x) Field Experience Work |
| (h) Weaving | |

670. History of the Art of Ancient Egypt, Mesopotamia, and Iran. Two credit hours. Autumn Quarter. Mr. Fanning.

The specialized study of the ancient arts of the valleys of the Nile and Tigris-Euphrates and their influence upon eastern Mediterranean culture including Ancient Persia. Lectures, discussions, and presentation by each student of some special problem of research.

***671. History of Hellenic Art.** Three credit hours. Autumn Quarter. Mr. Fanning.

The specialized study of Greek architecture, sculpture, and painting. Lectures, round table discussions and presentation by each student of some special problem of research.

†672. History of Islamic Art. Two credit hours. Winter Quarter. Alternating with Fine Arts 674. Mr. Fanning.

The study of Moslem architecture and minor arts with special attention to origins and influences. Lectures, reading, and reports.

†673. History of Christian Art of the Middle Ages. Three credit hours. Winter Quarter. Miss Holmes, Mr. Fanning.

The specialized study of various phases of Romanesque and Gothic art as an expression of medieval Christianity in Italy, France, Germany, Spain, and England. Lectures, reading, discussions, and reports on research topics.

674. History of Spanish Art. Two credit hours. Winter Quarter. Alternating with Fine Arts 672. Mr. Fanning.

The study of the architecture, sculpture, painting, and minor arts of Spain and the countries under Spanish influence. Lectures and reports.

***675. History of Latin-American Art.** Five credit hours. Spring Quarter. Mr. Seiberling.

History of the architecture, sculpture, painting and related arts of Mexico, and the Central and South American countries, from Pre-Columbian times to the present. The successive Mayan, Toltec, Incan, Aztec and transported European civilizations will be considered in the relation to the environmental, religious, political and economic factors that influenced them.

***681. History of British Art.** Two credit hours. Autumn Quarter. Mr. Fanning.

A study of the work of outstanding architects, painters, and sculptors in England as an index of the artistic trend since the beginning of the Sixteenth Century. Illustrated lectures, reading, and reports.

682. History of American Art. Five credit hours. Winter Quarter. Mr. Seiberling.

A study of architecture, painting, and sculpture in America during the Eighteenth, Nineteenth, and Twentieth Centuries. Illustrated lectures, reading, and reports.

683. Roman and Early Christian Art. Three credit hours. Autumn Quar-

* Not given in 1954-1955.

† Not given during the academic year, 1954-1955.

ter. Graduate students in art history must give satisfactory evidence that they have completed nine Quarter hours of methodology in art history and nine Quarter hours in the study of historic periods, or their equivalents. Mr. Fanning.

A survey of Roman art and the fusion of Byzantine and Roman influences in Christian art before the Middle Ages.

†684. The Art of the Northern Renaissance. Five credit hours. Autumn Quarter. Graduate students in art history must give satisfactory evidence that they have completed nine Quarter hours of methodology in art history and nine Quarter hours in the study of historic periods or their equivalents. Miss Holmes.

The art of France, Germany, the Netherlands and England from the waning of the Middle Ages through the Renaissance.

*685. Museum Problems. Three credit hours. Spring Quarter. Lectures, discussion, and practice in problems of the Art Museum, for graduates and advanced undergraduates.

A course in the functions of a museum, educational and technical; and selection and preservation of art works, their display, and the organization of exhibits; and the museum's relationship to its community and schools.

*686. History of Baroque Art. Five credit hours. Winter Quarter. Graduate students in art history must give satisfactory evidence that they have completed nine Quarter hours of Methodology in art history and nine Quarter hours in the study of historic periods, or their equivalents. Mr. Seiberling.

The evaluation of art from the end of the Renaissance to the Industrial Revolution with its correlation in the culture of the time.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

ART EDUCATION

661e, 662e, 663e. Technical Problems. See page 185.

715-716-717. Studio Seminar for the Practicing Art Teacher. Three to five credit hours each Quarter. Summer and Autumn Quarters. Mr. Barkan, Mr. Grimes.

The development of teaching personality through a unified experience which takes into account the fundamental factors of the art experience in studio work in related arts, sociological and philosophical aspects of art history, theoretical consideration of the technique of teaching, trips, two weeks off campus experience, visiting lecturers, etc.

718-719. Research Problems in Art Education. Three to five credit hours each Quarter. Spring Quarter. Mr. Barkan.

Based upon modern concepts of psychology and philosophy this course will consider problems of Arts Education on the elementary, secondary, and college level. Individual student problems will be initiated in light of current educational cultural needs. It is in this course that the nature of the student's thesis becomes finally defined.

†799. Art Workshop for Elementary Teachers. Four credit hours. Full time of student for first three weeks of second term. General prerequisites must include three years of work in professional education curriculum.

An intensive study of the creative art experience of children in relation to classroom procedure and practice. Planning and organizing the art program in the elementary school. Laboratory experimentation with art materials in the solution of advanced problems, group discussion, etc.

Not open to students who have credit for Fine Arts 620.

* Not given in 1954-1955.

† Not given during the academic year, 1954-1955.

ART HISTORY

In addition to the School of Fine and Applied Arts requirement of a broad background in Art History more advanced knowledge in some fields of specialization is required. Candidates transferring from other institutions must submit acceptable evidence of accomplishment to meet the requirement or take appropriate qualifying examinations.

For the Master's Degree ten hours of studio work is recommended in this area of specialization. This work is given as experience in the artist's problems rather than as professional training. Ten hours are elective and may be taken either in the history or studio areas. Twenty hours are required in the Art History area.

661a, 662a, 663a. Technical Problems. See page 185.

720. Introduction to Research Methods. Two to three credit hours. Autumn Quarter. Mr. Seiberling.

The factors that go into the chronological placement of a work of art and its attribution to a given artist. The bearing on this problem of art techniques, and of cultural and individual influences. The development and evaluation of bibliographical data and a survey of historical methods.

*721. Advanced Criticism. Two to three credit hours.

Bases for the criticism of art; historical treatments of the artist's problems and contemporary attitudes.

810. Seminar in the History of Art. Two or three credit hours. Spring Quarter. Miss Holmes.

This seminar, alternating with Fine Arts 721 will concern problems in the modern field, such as the influence on art of technology and science, of symbolism and of contemporary social and psychological viewpoints. The development of individual artists' works in relation to their time will also be assigned for research and group discussion.

811. Advanced Seminar in the History of Art. Two or three credit hours. Winter Quarter. Mr. Fanning.

A seminar taking in successive years the creative achievements of a given culture such as the Italian Renaissance, the Middle Ages, or that of Islam and Spain. Problems of connoisseurship, of cultural influence on art, or of stylistic analysis will be taken for individual research and group discussion.

812. Professional Orientation. Three to five credit hours. Spring Quarter. Miss Holmes, Mr. Seiberling.

Practical experience in the presentation of art material and analysis using research projects in the field.

CERAMIC ART

661c, 662c, 663c. Technical Problems. See page 185.

722. Ceramic Design Techniques. Three to five credit hours. Autumn Quarter. Mr. Bogatay.

Personal development in the techniques and processes of the ceramic designer with emphasis upon quality as evidenced in form, color, and decorations.

723. Ceramic Design Techniques. Three to five credit hours. Spring Quarter. Mr. Bogatay.

A continuation of Fine Arts 722.

813. Problems in Ceramic Composition. Three to five credit hours. Autumn Quarter. Mr. Littlefield.

Research in the development of special ceramic compositions pertinent to particular problems in ceramic design.

814. Problems in Ceramic Composition. Three to five credit hours. Spring Quarter. Mr. Littlefield.

A continuation of Fine Arts 813.

815. Historical Materials and Processes. Three to five credit hours. Winter Quarter. Mr. Atherton.

Original research in derivation and use of historical ceramic materials and processes with specific relation to the problems of the ceramic industrial designer or the practicing potter.

* Not given in 1954-1955.

816. Historical Materials and Processes. Three to five credit hours. Spring Quarter. Mr. Atherton.

A continuation of Fine Arts 815.

PAINTING

661p, 662p, 663p. Technical Problems. See page 185.

724-725. Painting. Three to five credit hours each Quarter. Autumn Quarter. Miss Bradley, Mr. Grimes, Mr. Sherman, Mr. Gatrell, Mr. King.

The painter's development as a creative artist. The relation of theory and practice. Readings, reports, discussion. Individual and group criticism on work in progress. Field trips and visiting specialists.

726-727. Mural Painting. Three to five credit hours each Quarter. Spring Quarter. Miss Bradley, Mr. Grimes, Mr. Sherman.

The problem of large scale wall painting. The development of the work from the initial analysis of the client's problem to the execution of the mural directly on the wall. Flat oil and dry fresco techniques.

817. Painting. Three to five credit hours. Winter Quarter. Miss Bradley, Mr. Sherman, Mr. Gatrell, Mr. King, Mr. Chadeayne.

A formal emphasis on the principles of abstraction basic to pictorial organization. Particular attention is given to the synthesis of subject matter, ideological concepts and emotional experience as it is related to the contemporary culture and traditional concepts.

SCULPTURE

661s, 662s, 663s. Technical Problems. See page 185.

728-729. Sculpture. Three to five credit hours each Quarter. Autumn Quarter. Three to five three-hour laboratory periods each week. Mr. Frey.

The presentation of approved sketch models and their realization in some permanent material such as stone, wood, or terra cotta, or other materials. Plaster casting. Monthly written reports on historical, technical and other problems leading to an understanding of the creative act. Lectures, seminars, reading assignments.

818. Sculpture. Three to five credit hours. Winter Quarter. Mr. Frey.

A continuation of Sculpture 728.

819-820. Sculpture. Three to five credit hours each Quarter. Spring Quarter. Mr. Frey.

Carving in stone or wood using problems specifically designed to meet the student's special needs. Written reports on reading assignments. Lectures and visits to museums.

GENERAL PROBLEMS

661, 662, 663. Technical Problems. See page 185.

701, 702, 703. Minor Problems. One to five credit hours. Autumn, Winter, and Spring Quarters. Mr. Seiberling, Mr. Frey, Mr. Sherman, Mr. Fanning, Mr. Littlefield, Mr. Atherton, Mr. Barkan, Miss Bradley, Mr. Chadeayne, Miss Holmes, Mr. Gatrell, Mr. Bogatay, Mr. Grimes, Mr. King, Mr. Rannels.

Open by permission of the graduate committee to graduate students who desire to initiate research problems in painting, sculpture, ceramics, history, graphics, medical art, or design. The students must present to the graduate committee before registration a clearly defined program approved by his prospective instructor.

For letters designating areas, see 661-662-663, page 177.

801, 802, 803. Research Problems. Three to five credit hours. Autumn, Winter and Spring Quarters. Enrollments in these courses may be continued up to a total of fifteen hours each. Mr. Seiberling, Mr. Frey, Mr. Fanning, Mr. Sherman, Mr. Grimes, Mr. Littlefield, Mr. Atherton, Miss Holmes, Miss Bradley, Mr. Barkan, Mr. Chadeayne, Mr. Gatrell, Mr. Bogatay, Mr. King.

This course is open by permission of the graduate committee to graduate students who have demonstrated ability to do original research. The student must present for approval to the graduate committee before registration a clearly defined program approved by his prospective instructor.

804, 805, 806. Research in Art History, Criticism, and Philosophy of Art. Two to five credit hours. Autumn, Winter and Spring Quarters. Enrollments in these numbers may be continued up to a total of fifteen hours each. Mr. Seiberling, Mr. Frey, Mr. Fanning, Mr. Sherman, Mr. Grimes, Mr. Littlefield, Mr. Barkan, Mr. Atherton, Miss Bradley, Mr. Chadeayne, Miss Holmes, Mr. Gatrell, Mr. Bogatay.

This course is open by permission of the graduate committee to graduate students who have demonstrated ability to do original research. The student must present for approval to the graduate committee before registration a clearly defined program approved by his prospective instructor.

950. Advanced Research in Fine Arts. Autumn, Winter, Spring, and Summer Quarters. Mr. Seiberling, Mr. Fanning, Mr. Frey, Mr. Sherman, Mr. Grimes, Mr. Littlefield, Mr. Barkan, Mr. Gatrell, Mr. Chadeayne.

Dissertation.

FRENCH

(See Romance Languages and Literatures)

GENETICS

Graduate work in genetics is offered by several departments. Fundamental and theoretical genetics is given by the Department of Zoology and Entomology and the Department of Botany and Plant Pathology. The courses in these departments are biological rather than strictly zoological or botanical in subject matter.

Practical work in genetics is given by the various specialized departments such as Agronomy, Animal Science, Dairy Science, Horticulture, and Poultry Science.

The M.A. and Ph.D. degrees with specialization in genetics may be secured through any of the above-named departments. Graduate students are encouraged to formulate interdepartmental programs of study and research. These programs must satisfy general requirements for the degree sought as specified by the departments concerned and by the Graduate School.

In addition to the general requirements, the Ph.D. degree with specialization in genetics specifically requires satisfactory completion of at least the two following courses of instruction: Zoology 602 and Zoology 900. Both of these courses have prerequisites which are stated in the course descriptions under the offerings of the Department of Zoology and Entomology.

The professional geneticist of today must have a thorough knowledge of both the zoological and botanical aspects of biology and a good understanding of the biological aspects of chemistry, physics, and geology. Incoming graduate students will be expected to make up any deficiencies in their undergraduate training. Details in this connection are handled by the adviser or the interdepartmental advisory committee.

The following courses in genetics are available to graduate students, and their descriptions should be consulted under the offerings of the several departments:

Zoology 603
Zoology 618
Zoology 705
Zoology 706
Zoology 707
Zoology 840
Zoology 900
Agronomy 607
Dairy Science 611
Botany 635
Botany 737
Botany 740
Horticulture 601
Poultry Science 606

Fundamental Genetics
The Cytological Basis of Genetics
Physiological Genetics
Population Genetics
Human Genetics
Analysis of Modern Genetics
Seminar in Genetics
Field Crop Breeding
Advanced Live Stock Breeding
Plant Genetics
Plant Cytology
Plant Cytogenetics
Horticultural Plant Breeding
Poultry Genetics

All of these departments also offer Special Problems (701) and Research (950) in genetics.

The Institute of Genetics, an interdepartmental organization of geneticists, conducts an informal non-credit seminar each Friday afternoon at four o'clock during the school year. An interest in genetics is the sole requirement for attendance. Advance notices of topics are sent out and will be furnished to off-campus addresses upon requests to the Institute of Genetics, Room 325, Botany and Zoology Building.

GEODESY

The course offerings of the Institute of Geodesy, Photogrammetry and Cartography are given in the several cooperating departments, comprising Geography, Geology, Mathematics, and Physics and Astronomy. Courses in Geodesy and Photogrammetry are described under Geology, Course Numbers 640, 645, 740, 745, 750, 755, 840, and 845. Courses in Cartography are described under Geography, Course Numbers 611, 612, 702, and 812. For information concerning the Institute program, write Professor Carl A. Lamey, Chairman, Department of Geology, Room 104, Orton Hall. See also page 49.

GEOGRAPHY

Office, 136 Hagerty Hall

PROFESSORS SMITH, HUNTINGTON (EMERITUS), VAN CLEEF, PEATTIE, CARLSON, AND WRIGHT, ASSOCIATE PROFESSOR RANDALL, ASSISTANT PROFESSOR HOFFMAN

Prerequisites for Graduate Work in Geography. Any student with an undergraduate major in geography or with 40 Quarter hours or the equivalent in geography and closely allied fields may begin the graduate study of geography. A student who has inadequate preparation will be required to make up the deficiencies. The department may at its discretion give a qualifying examination to determine a student's eligibility to pursue the study of geography leading to the Master of Arts degree or the Doctor of Philosophy degree.

Departmental Committee on Graduate Work. All graduate work in geography is under the jurisdiction of a departmental committee consisting of the staff members above the rank of instructor. One member of the committee, usually of the student's choice, serves as the candidate's adviser. (The general course of study is arranged in consultation with the adviser.) The chairman of the department serves as chairman of the Committee on Graduate Work and the mechanics of registration are usually handled by him.

Departmental Requirements for the Master of Arts Degree: Ordinarily a graduate student with an undergraduate major in geography can complete the requirements for the Master's degree in three quarters of full-time graduate work or the equivalent in part-time work. In general, the candidate must attain a broad knowledge of the elements of the physical environment and the cultural features of the landscape, and demonstrate an ability to assemble, organize, interpret, and present the results of geographical study in scholarly form. The sequence of studies should include a balanced program of systematic and regional courses. An appropriate thesis topic will be selected in consultation with the adviser. An examining committee consisting of at least two members of the senior staff with the adviser serving as chairman will test the candidate's knowledge of the field of geography and his scholarly attainments as represented by the thesis.

Departmental Requirements for the Ph.D. Degree: Candidates for the Doctor's degree should have a broad and liberal training, not only in geography but in closely related natural and social sciences.

1. The foreign language requirement. The candidate shall have as a minimum skill a dictionary reading knowledge of German and French. Some other modern language may be substituted for French if it is of major importance in the candidate's field of specialization and will be particularly useful in the preparation of the dissertation.
2. All candidates shall present evidence of training on an advanced level in systematic geomorphology and the regional physiography of the United States or some other major geographical area which is the candidate's major field of specialization.
3. All candidates will present evidence of an understanding of the fundamental concepts of economics.
4. Fields of concentration. Since geography may be regarded as both a physical and social science it is expected that each candidate will indicate in which of these broad fields he wishes to specialize.
 - a. If the candidate is particularly interested in physical geography it is expected that he will broaden his training in geology, climatology, soil science, ecology and other closely allied fields.

- b. Similarly, if the candidate is particularly interested in cultural geography, he will strengthen his training in economics and in one or more of the other social sciences such as history, political science, anthropology, sociology or other closely allied fields.
5. A candidate for the Doctor's degree will be required to pass general examinations covering (a) the systematic branches of physical and cultural geography, (b) regional geography of the world, (c) the philosophy and history of geography, (d) cartography, and (e) techniques of geographic research. (See page 45).
6. The subject of the dissertation shall be selected in consultation with the adviser and must have the approval of the committee on graduate work.

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

603. The Localization of Manufacturing Industries. Three credit hours. One Quarter. Winter and Spring. Three class meetings each week. General prerequisites must include elementary courses in geography or in economics. Mr. Wright.

The geography of manufacturing, particularly American industries. Industrial districts. Special study of representative industries as to: labor supply; sources, quantity, and value of material and power used; transportation facilities available; quantity and value of products; and problems of competition and markets.

604. Conservation of Natural Resources. Three credit hours. Autumn Quarter. Three class meetings each week. General prerequisites must include elementary courses in geography or fifteen hours of allied subjects. Mr. Wright.

The importance of our natural resources. The need for their conservation. Land as a natural resource and economic factor. Character and location as factors in land utilization and value. Regional and national planning for resource utilization.

605. Geography of Ohio. Three credit hours. Winter Quarter. Three class meetings each week. General prerequisites must include elementary courses in geography or fifteen hours of allied subjects. Mr. Wright.

Geographic influences in the history of the state. Ohio's agriculture, industries, and social conditions, together with the underlying physical, climatic, and other environmental factors that have contributed to the present development of the region.

611. Cartography and Map Interpretation. Three credit hours. Winter Quarter. Three class meetings each week. General prerequisites must include elementary courses in geography or ten hours of allied subjects. Mr. Smith.

The interpretation and appreciation of maps. A graphical and geometrical consideration of the major systems of map projections and their use for cartographic purposes. A survey and analysis of the various map series published by the several map-making agencies of the United States Government, by foreign countries, and by private map-producing organizations.

612. Map Projections. Three credit hours. Spring Quarter. Three class meetings each week. General prerequisites must include acceptable courses in college mathematics. Mr. Kukkamäki.

A mathematical consideration of the various map projections and grids having practical usefulness in the production of the major map series. Particular attention will be given to Lambert's conformal conic, the stereographic, the polyconic, the Mercator, the universal transverse Mercator, and other projections of special importance in cartography.

615. Climatology. Four credit hours. Autumn Quarter. Four class meetings each week. General prerequisites must include fifteen hours in natural or social science, including courses in one of the following: geography-meteorology, botany, or agronomy. Mr. Smith.

Elements of climate and their distribution. The controls of climate. Types of climate and their distribution with particular reference to agricultural production, natural vegetation and the major soil groups. Climates and their effects on the economic and other activities of man.

621. Geography of Europe. Three credit hours. Autumn Quarter. Three class meetings each week. General prerequisites must include elementary courses in geography. Open to graduate students majoring in economics, history, political science, or other closely related fields with permission of the department. Mr. Van Cleef.

The geographic factor in the economic, social, and political progress of the nations. Current major problems of the continent in the light of their geographic background. Consideration given to some geopolitical problems.

624. Geography of Latin America. Three credit hours. Winter Quarter. Three class meetings each week. General prerequisites must include elementary courses in geography. Open to graduate students majoring in economics, history, political science, or other closely related fields with permission of the department. Mr. Carlson.

Geographic regions of Mexico, Central America, the West Indies, and South America. The development of the political divisions in relation to their geographic conditions. Special emphasis is placed on the geographic analysis of Inter-American affairs.

625. Geography of the Far East. Three credit hours. Spring Quarter. Three class meetings each week. General prerequisites must include elementary courses in geography. Open to graduate students majoring in economics, history, political science, or other closely related fields with permission of the department. Mr. Hoffman.

The geographical character and regional divisions of monsoon Asia. The major activities of the people in the regions of densest population and greatest economic importance.

626. Geography of the Middle East. Three credit hours. Spring Quarter. Mr. Randall.

Geographic concept of the Middle East. A consideration of its natural regions in relation to the local and international political problems. The importance of the physical and cultural patterns in relation to the current economies.

627. Geography of Africa. Three credit hours. Winter Quarter. Given in alternate years. Three class meetings each week. General prerequisites must include elementary courses in geography. Also open to seniors and graduate students majoring in history, political science, sociology, and closely related fields with permission of the department. Mr. Peattie.

The geographic character of Africa. A consideration of structure, climate, problems of disease, population, resources, and economies, both native and introduced. A study of the chief regions of Africa with particular emphasis on the areas and countries of greatest economic and international importance.

631. The Historical Geography of Commerce. Three credit hours. One Quarter. Autumn, Winter, Spring. Three class meetings each week. General prerequisites must include elementary courses in geography or in history. Mr. Peattie.

Geographic factors in commerce to 1800. Resources and production in the ancient and medieval world. Trade routes in relation to exchange of ideas. Geographic elements in the early origin of many present-day commercial practices.

633. The Geography of Modern Commerce. Three credit hours. One Quarter. Autumn and Spring. Three class meetings each week. General prerequisites must include elementary courses in geography. Mr. Carlson.

Unequal distribution of natural resources and differences in industrial and social development as basic factors in interregional trade. A consideration of the major raw materials and other important commodities in international commerce. Geographic factors in the establishment and development of trade routes. Concluded with a discussion of major trade areas.

634. Urban Geography. Three credit hours. One Quarter. Winter and Spring. Three class meetings each week. General prerequisites must include elementary courses in geography. Mr. Van Cleef.

Geographic factors in the origin and growth of urban centers. Analysis and synthesis of the economic and physical structure and functions of trade centers in the light of their geographic setting; areal expansion; inter-trade center relations. Each of the foregoing aspects examined in relation to city planning.

***651. Philosophy of Cultural Geography.** Three credit hours. Winter Quarter. Given in alternate years. Three class meetings each week. General prerequisites must include elementary courses in geography or in history. Mr. Peattie.

An advanced course in human geography treating of environmentalism, regionalism, and other doctrines which find expression in politics, literature, and the arts. A critical examination of the philosophical elements in geography.

* Not given in 1954-1955.

***700. Field Work in Geography.** Two credit hours. Spring Quarter. General prerequisites must include twelve hours of geography. Given in alternate years. Mr. Randall.

A course in the practice of field observation and geographic mapping.

701. Special Problems in Geography. Two to fifteen credit hours. Autumn, Winter, and Spring Quarters. Assigned readings, conferences, and reports. General prerequisites must include eighteen hours of geography and consent of the instructor.

Individual study of a special problem or a particular region.

702. Special Problems in Cartography. Two to five credit hours. Autumn, Winter, and Spring Quarters. Conferences and laboratory periods to be arranged. Required in the Curriculum in Geodesy, Photogrammetry and Cartography. General prerequisites must include fifteen hours in geography or closely allied fields and consent of the instructor. Mr. Smith.

Individual or group study of major cartographical problems such as: techniques and problems of map compilation, map design, color separation, map reliability, analysis of source materials, toponymy, graphical symbolism, physiographic drawing, etc.

712. Political Geography. Three credit hours. Winter Quarter. Three class meetings each week. General prerequisites must include fifteen hours of political science including Political Science 613, or thirteen hours of geography. Mr. Randall.

The geographical characteristics of political areas. A consideration of size, shape, frontiers, resources and technological advancement in relation to economic and political strength. Land power versus sea power. Buffer states. Geographical aspects of colonialism. The geographical factors in geopolitics. Special attention will be given to selected areas and problems of historical and current importance.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

803. Economic and Industrial Geography. Two to five credit hours. Autumn, Winter, and Spring Quarters. General prerequisites must include forty hours in the related social sciences, thirty hours of which must be in geography. Mr. Smith, Mr. Van Cleef, Mr. Wright.

Readings and research in economic and industrial geography.

805. Political and Historical Geography. Two to five credit hours. Autumn, Winter, and Spring Quarters. General prerequisites must include forty hours in the related social sciences, thirty hours of which must be in geography. Mr. Smith, Mr. Peattie, Mr. Randall.

Readings and research in political and historical geography.

807. Physical Geography. Two to five credit hours. Autumn, Winter, and Spring Quarters. General prerequisites must include forty hours in geology and geography. Mr. Smith, Mr. Carlson.

Reading in the classic and current literature on the land features of the earth.

811. History of Geography. Three credit hours. Spring Quarter. Three class meetings each week. General prerequisites must include eighteen hours of geography. Mr. Van Cleef.

Readings in the classics. The history of the development of geographic theories. Modern tendencies as seen in current literature.

812. Cartography and Map Intelligence. Two to five credit hours. Autumn, Winter, and Spring Quarters. General prerequisites must include thirty hours in geography and closely allied fields. Mr. Smith, Mr. Randall.

Readings and research in cartography, graphics, and map intelligence.

850. Seminar in Geography. Two credit hours. Autumn, Winter, and Spring Quarters. Not more than two seminars to be given each Quarter. Subject to be announced each Quarter.

* Not given in 1954-1955.

950. Research in Geography. Autumn, Winter, and Spring Quarters.

Research work in historical and political geography will be conducted under the direction of Mr. Peattie or Mr. Randall; in geography of conservation and land utilization under the direction of Mr. Wright; in economic geography under the direction of Mr. Van Cleef, Mr. Smith or Mr. Wright; in physical geography and climatology under the direction of Mr. Carlson or Mr. Smith; in commercial and urban geography under the direction of Mr. Van Cleef or Mr. Carlson. Research in regional geography is under the direction of the following. North America: Mr. Smith, Mr. Wright, Mr. Randall; Latin America: Mr. Carlson; Europe: Mr. Van Cleef, Mr. Smith, Mr. Peattie; Far East: Mr. Smith; Middle East: Mr. Randall; Africa: Mr. Peattie.

Conference, assigned problems, and reports.

GEOLOGY†

Offices, 103 Orton Hall

PROFESSORS LAMEY, CARMAN (EMERITUS), SPIEKER (RESEARCH PROFESSOR), STEWART, GOLDTHWAIT, FULLER, SCHOPF, AND HEISKANEN, ASSOCIATE PROFESSORS BATES AND LAROCQUE, ASSISTANT PROFESSORS SUMMERSON, MOORE, PINCUS, WHITE, AND DOYLE, AND LECTURERS

Prerequisites for Graduate Work: Students intending to take graduate work in geology should preferably have made geology a major undergraduate study, and in any event should have completed at least thirty Quarter hours (twenty semester hours) of work in geology and mineralogy, with supporting work in chemistry and mathematics (at least through trigonometry), and, if possible, in physics and biology also.

Students whose training falls short of these specifications are not debarred from entrance into graduate work, but the time spent making up deficiencies cannot normally be accredited as work done toward the graduate degree.

All candidates for advanced degrees must have had field experience at least equivalent to that afforded by the field course offered by this department. Entering students who lack such experience are urged to take Geology 627 or its equivalent elsewhere during the summer preceding entrance into the regular academic year.

Specialization within the Field of Geology

Geology is a very broad field, and it embraces many areas of possible specialization. Those which are cultivated at the Ohio State University may be grouped under four fundamental headings, as follows:

1. Stratigraphy—paleontology
 - a. General stratigraphy, paleontologic emphasis
 - b. Petroleum geology, paleontologic emphasis
 - c. Sedimentology
 - d. Economic geology of non-metals, including coal
2. Stratigraphy—structural geology
 - a. General stratigraphy, structural emphasis
 - b. Structural geology
 - c. Areal geology
 - d. Petroleum geology, structural emphasis
3. Geomorphology, glacial geology, and Quaternary stratigraphy
 - a. General geomorphology
 - b. Glacial geology and glaciology
 - c. Groundwater geology
4. Petrology, mineralogy, and ore deposits
 - a. Petrology
 - b. Ore deposits
 - c. Industrial deposits

In addition to these specialties there are many fields of applied geology such as engineering geology, mining geology, and geophysics, preparation for which should be general and should spread rather widely among the categories listed above.

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

601. Geomorphology. Five credit hours. Autumn Quarter. Four class meetings and one two-hour laboratory period each week. Saturdays must be kept open for field trips. General prerequisites must include elementary courses in geology and map reading.

A detailed study of the processes which shape the land surface, and the forms produced. These are inspected on topographic maps and in the area near Columbus.

† For courses in mineralogy and petrography see the Department of Mineralogy.

602. Structural Geology. Five credit hours. Winter Quarter. Four class meetings and one two-hour laboratory period each week. General prerequisites must include elementary courses in geology, geologic map interpretation and trigonometry. Mr. Moore.

A study of the principal kinds of geologic structure, mainly descriptive and diagnostic, but in some part interpretative. Practice in the recognition, analysis, depiction, and measurement of structure on geologic maps and sections, and by various mathematical devices, graphic as well as computational.

605. Economic Geology: Metals. Five credit hours. Autumn Quarter. Five class meetings each week. General prerequisites must include elementary courses in geology and mineralogy. Mr. Lamey.

A study of the characteristics and origin of metallic mineral deposits.

606. Economic Geology: Non-Metals and Coals. Five credit hours. Winter Quarter. Five class meetings or lectures each week. General prerequisites must include elementary courses in geology and mineralogy. Mr. Bates.

A study of non-metallic materials except petroleum. Origin, properties, classification, and distribution of the industrial minerals and rocks, and coal, with special emphasis on the coals of Ohio.

607. Economic Geology: Petroleum. Five credit hours. Spring Quarter. Three class meetings and two two-hour laboratory periods each week. General prerequisites must include four Quarters of geology or of geology and mineralogy. Mr. Bates.

A study of the principles of petroleum geology.

***608. Stratigraphic Geology of Ohio.** Five credit hours. Autumn Quarter. Given in alternate years. General prerequisites must include Geology 618, and consent of the instructor.

Field trips with reports, lectures, and assigned readings. Field trips on Saturdays (entire day) while the weather permits.

The geological formations of Ohio are studied in the field, by rock specimens, and by assigned readings. This course is intended to acquaint the student with the rock formations of Ohio.

609. Petrology. Five credit hours. Winter Quarter. Four class meetings and one two-hour laboratory period each week. General prerequisites must include elementary courses in geology and mineralogy. Mr. Lamey.

A study of the occurrence, association, chemical relationships, and distribution of rocks, with laboratory study in rock identification.

610. Geomorphology of Eastern United States. Four credit hours. Winter Quarter. Four class meetings each week. Given in alternate years. General prerequisites must include Geology 601. Mr. White.

A study of the physiographic regions of the United States east of the Great Plains. The topographic form and physiographic history with a resumé of geologic history as background.

***611. Geomorphology of Western United States.** Four credit hours. Winter Quarter. Four class meetings each week. Given in alternate years. General prerequisites must include four Quarters of geology, or of geology and geography, including Geology 601. Mr. White.

A study of the physiographic regions of United States west of the Central Lowlands. The topographic forms and physiographic history with a resumé of geologic history as background.

613. Glacial Geology. Five credit hours. Spring Quarter. Saturdays must be kept open for field trips. General prerequisites must include elementary courses in geology and preferably Geology 601. Mr. Goldthwait.

Living glaciers and the features produced by glaciers, present or past, with special reference to features produced in Ohio.

615. Geological Surveying. Three credit hours. Spring Quarter. One class meeting and two field or laboratory periods each week. General pre-

* Not given in 1954-1955.

requisites must include elementary courses in geology, geologic map interpretation, and trigonometry. Permission of the instructor must be obtained. Mr. Summerson.

A study of the fundamental techniques used in field mapping, and field practice in the use of most standard instruments and methods; an introduction to the use of aerial photographs with special emphasis on photogrammetric methods.

618. Paleozoic Stratigraphy. Three credit hours. Winter Quarter. General prerequisites must include elementary courses in historical geology and paleontology. Mr. Summerson.

The principles of stratigraphy and related historical geology, developed by study of selected American and European Paleozoic examples.

619. Mesozoic and Cenozoic Stratigraphy. Three credit hours. Spring Quarter. General prerequisites must include elementary courses in historical geology and paleontology. Mr. Spieker.

The principles of stratigraphy and related historical geology, developed by study of selected American and European Mesozoic and Cenozoic examples.

622. Survey of Vertebrate Paleontology and Paleobotany. Three credit hours. Winter Quarter. Three two-hour class laboratory meetings each week. General prerequisites must include elementary paleontology. Given in alternate years. Mr. LaRocque.

The paleontology and paleoecology of fossil plants and vertebrates.

***623. Micropaleontology.** Three credit hours. Spring Quarter. Laboratory work conducted by conference. Prerequisite, Geology 520. Given in alternate years. Miss Stewart.

A study of fossil microorganisms, especially the foraminifera. The course is designed to give a general knowledge of the structure, habits, taxonomic relationships, and phylogenetic development of these organisms. The use of microorganisms in stratigraphic correlation, especially in petroleum geology, is stressed.

624. Advanced Invertebrate Paleontology. Three credit hours. Autumn Quarter. General prerequisites must include elementary paleontology. Mr. LaRocque.

Laboratory study of fossil faunas, including paleontological techniques and procedures.

†627a. Field Geology. Six credit hours. First term. Summer Quarter. General prerequisites must include Geology 615 and an elementary course in the Common Rocks and consent of the instructor; Geology 618 and 619 are also recommended. Mr. Spieker and staff.

Concentrated training in the basic essentials of field observation and mapping. The course occupies the full time of the student through the term. The work is done in central Utah, with headquarters in Ephraim.

This course does not carry graduate credit towards the Master's degree.

Not open to students who have credit for Geology 627. This course is the first half of Geology 627.

†627b. Field Geology. Six credit hours. Second term. Summer Quarter. General prerequisites must include Geology 627a. Mr. Spieker and staff.

This course is the direct continuation of Geology 627a.

This course does not carry graduate credit towards the Master's degree.

Not open to students who have credit for Geology 627. This course is the second half of Geology 627.

†628. Advanced Field Geology. Fifteen credit hours. Summer Quarter. General prerequisites must include Geology 627 or the equivalent in field experience and campus courses. Permission of the instructor must be obtained. Graduate staff.

Practice at professional field work, in a party engaged in geologic mapping, under the immediate supervision of the party chief, and the general supervision of the instructor.

* Not given in 1954-1955.

† Not given during the academic year, 1954-1955.

629. Field Geology. Three credit hours. Autumn Quarter. General prerequisites must include Geology 627b. Mr. LaRocque, Mr. Moore, Mr. White. Preparation of a complete report based on field data obtained in Geology 627a and 627b.

631. Subsurface Geology. Five credit hours. Autumn Quarter. General prerequisites must include Geology 602, 607, 618, and 619 or senior standing in Petroleum Engineering. Mr. Bates.

A study of techniques and methods of subsurface geologic correlation and illustration and a survey of geophysical methods with special reference to the petroleum industry.

635. Introductory Geophysics. Three credit hours. Spring Quarter. Three class meetings each week. General prerequisites must include ten hours of elementary geology, ten hours of elementary physics, plus twenty hours of physics or geology, or physics and geology. Mr. Pincus.

Principles and techniques of geophysics, with emphasis on gravity and isostasy, geomagnetism, and seismology, and their application to geophysical prospecting; also briefer discussions of heat flow in the crust and terrestrial electricity. Treatment of subject matter usually non-mathematical.

636. Engineering Geology. Five credit hours. Winter Quarter. Three class meetings, two two-hour laboratory periods each week. Geology 602 must be included in the general prerequisites or taken concurrently. Mr. Melvin.

Applications of the principles and techniques of geology in the field of civil engineering.

640. Geodesy II. Three credit hours. Winter Quarter. Two class meetings and one three-hour computation period each week. General prerequisites must include an introductory course in geodesy and Mathematics 601. Mr. Heiskanen.

Observational errors. Weighing of observations. Observation condition and normal equations. Adjustments of triangulation, spirit leveling and supplemental geodetic figures.

645. Photogrammetry II. Three credit hours. Winter Quarter. Two class meetings and one three-hour laboratory period each week. General prerequisites must include introductory courses in photogrammetry and plane surveying, Mathematics 601, Physics 606, Photography 625, and Geology 601. Mr. Doyle.

Terrestrial and aerial photogrammetry. Horizon and statescope methods. Interior and exterior orientation of the photograph. Rectification of aerial photographs. Construction of maps from aerial photography. Stereoscopic principles. Practical applications.

701. Special Problems. One to five credit hours. All Quarters. Assigned readings, conferences, and reports. General prerequisites must include permission of the instructor.

A study of special topics by conferences and reports. Laboratory, library or field work.

Properly qualified students may carry on work in stratigraphy, sedimentation, structural geology, economic geology, petrology, opaque ore mineral studies, paleontology and geomorphology under the direction of the appropriate members of the department.

705. Recent Advances in Coal Geology. Three credit hours. Spring Quarter. One Saturday field trip. General prerequisites must include acceptable courses in historical geology, Geology 606 or equivalent with permission of the instructor. Mr. Schopf.

Review and discussion of selected current literature on the origin, constitution, petrography, and metamorphism of coal; quality evaluation of coal deposits. Current work is evaluated and interrelated with antecedent literature as regards the broader objectives of coal geology.

713. Sedimentary Petrography I. Three credit hours. Spring Quarter. One lecture and six hours of laboratory work each week. General prerequisites must include courses in advanced general geology. Mr. Summerson.

The theory and application of various techniques in the laboratory study of sediments and sedimentary rocks. Mechanical analysis, determination of fundamental physical characters of sedimentary materials. Statistical procedures for representation of results. The problem of interpretation: possible uses of the various laboratory data in determining condition of origin and in other concerns of the stratigrapher such as correlation.

Not open to students who have credit for Geology 813.

714. Sedimentary Petrography II. Three credit hours. Autumn Quarter. Nine hours of laboratory work each week. General prerequisites must include Mineralogy 621 or its equivalent. Mr. Moore.

Laboratory preparation of sedimentary rocks for microscopic examination, the microscopic study of the component fractions of such rocks, and the interpretation of results.

Not open to students who have credit for Geology 814.

740. Geodesy III. Three credit hours. Spring Quarter. Two class meetings and one three-hour computation period each week. General prerequisites must include Geology 640, Mathematics 611, and Astronomy 615. Mr. Heiskanen.

Reference ellipsoids. Geodetic lines. Computation of geographic coordinates on the ellipsoid and conversion of plane coordinates. Consideration of the geoid, deflections of the vertical and gravity anomalies.

745. Photogrammetry III. Three credit hours. Spring Quarter. Two class meetings and one three-hour laboratory period each week. General prerequisites must include Geology 645. Mr. Doyle.

Cameras, lenses, filters. The statoscope. Rectification equipment. Stereometric instruments. Stereoscopic plotting instruments.

750. Special Problems in Geodesy. Three to fifteen credit hours. All Quarters. General prerequisites must include satisfactory courses in the field of the problem undertaken. (Students are allowed repeated registration within the total hours indicated.) Mr. Heiskanen.

The more complete aspects of triangulation, adjustment computations, and precise spirit leveling. Navigation, electronic measuring methods. Gravimetric methods. Size and shape of the Earth. History of geodesy.

755. Special Problems in Photogrammetry. Three to fifteen credit hours. All Quarters. General prerequisites must include Geology 745. (Students are allowed repeated registration within the total hours indicated.) Mr. Doyle.

Control points. Picture triangulation. Space triangulation. Stereometric methods. Accuracy of photogrammetric maps. Comparison of different types of photogrammetric instruments and methods. Photo-interpretation. Photogeology.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

If the student intends to specialize in paleontology he must have had in addition courses in zoology; if in inorganic geology, courses in chemistry, physics and mineralogy; if in geomorphology, courses in physics, chemistry, and geography.

***810. Geology of the Eastern United States.** Three credit hours. Winter Quarter. Lectures, readings, conferences. Given in alternate years. General prerequisites must include acceptable courses in historical and structural geology. Mr. Summerson.

A review of the important stratigraphic and structural features of the Eastern United States. Special attention is given to the correlation of the important formations, the major structures and the paleogeography of the region.

***811. Geology of the Western United States.** Three credit hours. Spring Quarter. Lectures, readings, conferences. Given in alternate years. General prerequisites must include acceptable courses in historical and structural geology. Mr. Spieker.

A review of the important stratigraphic and structural features of the Western United States, as exemplified by the Cordilleran region. Special attention is given to the correlation of the important formations, the major structures, and the paleogeography.

812. Principles of Sedimentation and Stratigraphy. Three credit hours. Autumn Quarter. Three lectures each week. General prerequisites must include courses in advanced general geology. Mr. Spieker.

The origin, constitution, and relationships of stratified rocks; an approach to the outstanding problems of stratigraphy, in which attention is given chiefly to processes of sedimentation and their results, the interpretative study of sedimentary rocks, and the general problems of correlation.

* Not given in 1954-1955.

815. Seminar in Metamorphism. Three credit hours. Spring Quarter. General prerequisites must include Geology 609 or its equivalent. Mr. Lamey.

A study of the processes of metamorphism, with a critical analysis of the rock types produced.

817. Seminar in Earth Tectonics. Two credit hours. Spring Quarter. Mr. Spieker.

Conferences covering the broader and more fundamental problems of earth structure, involving chiefly the nature and origin of crustal forces.

820. Pre-Cambrian Geology. Three credit hours. Autumn Quarter. General prerequisites must include courses in petrology, structural geology, and stratigraphy. Mr. Lamey.

A study of the principles of pre-Cambrian Geology, and the geology of important pre-Cambrian areas.

821. Paleozoic Geology. Three credit hours. Winter Quarter. General prerequisites must include Geology 618 and 619. Given in alternate years. Mr. Summerson.

A study of the Paleozoic systems of the United States, their physical development, subdivision, faunal sequences, and correlation with homotaxial deposits abroad.

822. Mesozoic and Cenozoic Geology. Three credit hours. Spring Quarter. General prerequisites must include Geology 618 and 619. Given in alternate years. Mr. Spieker.

A study of the outstanding Mesozoic and Cenozoic sections of the world, with emphasis on principles of nomenclature, subdivision, correlation, and interpretation.

***823. Quaternary Geology.** Three credit hours. Winter Quarter. General prerequisites must include Geology 613. Given in alternate years. Mr. Goldthwait.

Chronology of Pleistocene glacial and interglacial events throughout the world, involving drift sheets, losses, river terraces, and strandlines; the use of animal and plant remains, soils, and radiocarbon in determining this chronology.

***825. Advanced Structural Geology.** Five credit hours. Spring Quarter. General prerequisites must include Geology 602. Given in alternate years. Mr. Pincus.

An examination of the principles involved in the recognition and interpretation of geological structures. The results of field observation, laboratory experiment, and theoretical analysis are brought together and applied to the problems of selected structural provinces.

827. Advanced Geomorphology. Three credit hours. Winter Quarter. Three class meetings each week. General prerequisites must include Geology 601. Given in alternate years. Mr. Goldthwait.

A seminar devoted to current and classical problems in geomorphology, such as the origin of submarine canyons or pediments.

***831. Principles of Ore Deposition.** Three credit hours. Spring Quarter. General Prerequisites must include courses in metallic mineral deposits and petrology. Given in alternate years. Mr. Lamey.

A seminar in the study of the principles of ore deposition making use of selected examples of the more important types of ore deposits of the world.

840. Advanced Studies in Geodesy. Three to fifteen credit hours. All Quarters. General prerequisites must include acceptable courses in geodesy and mathematics. (Students are allowed repeated registration within the total hours indicated.) Mr. Heiskanen.

Different methods for computation of the size and shape of the Earth. Gravity formulas. Formulas of Clairaut and Stokes. World geodetic system. Eclipses and occultations in the service of geodesy. Electronic methods. Navigation. Isotasy. Structure of the Earth's interior.

845. Advanced Studies in Photogrammetry. Three to fifteen credit hours. All Quarters. General prerequisites must include Geology 745. (Students are allowed repeated registration within the total hours indicated.)

* Not given in 1954-1955.

Lectures and individual studies of the quality, economy, and reliability of different photogrammetric instruments and methods.

851. Seminar in the History of Geology. Three credit hours. Spring Quarter. Mr. LaRocque and the Graduate Staff.

Discussion of the development of geologic science, led by a staff member but prepared and offered largely by the students, intended to give the graduate student a firm basis for comprehension of the science as it exists today.

855. Seminar in Paleoecology. Three credit hours. Spring Quarter. General prerequisites must include Geology 624. Mr. LaRocque.

A study of the principles of Paleoecology with illustrations from the literature and from selected faunules.

950. Research in Geology. Autumn, Winter, and Spring Quarters. Field, laboratory and library study. General prerequisites must include acceptable courses in the field chosen. The Graduate staff.

GERMAN

Office, 213 Derby Hall

PROFESSORS BLUME, MAHR, SEIDLIN, AND SPERBER, ASSOCIATE PROFESSOR FLEISCHHAUER, ASSISTANT PROFESSOR WONDERLEY

Prerequisites for Graduate Work: Candidates for advanced degrees must present on admission to the graduate field an undergraduate major in German from a recognized college or its equivalent.

Requirements for the Master's Degree: Generally speaking one full year will suffice for the Master's degree, but each case will be considered individually by the department. At least fifteen hours in 800 courses will be required and about one-half of the work divided between linguistic and advanced practice courses. Wide reading in classical and modern literature is essential.

Requirements for Ph.D. Degree: For the doctorate the major may be selected from the literary or the linguistic field, with about two-thirds of the work assigned to the major field and one-third to the minor.

Candidates for the doctorate in German must present a knowledge of a Romance language which is the equivalent of at least two courses in the "600" group, or a working knowledge of either Latin or Greek.

501. Rapid Reading for Graduate Students. No credit. Autumn, Winter, and Spring Quarters. Three recitations each week. Open only to graduate students. Students registering for this course are expected to be familiar with the fundamentals of German. Mr. Fleischhauer, Mr. Wonderley.

An accelerated course designed to develop reading ability. Systematic study of practical problems encountered in interpreting and translating technical German.

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

1954-1955:

611. German Literature of the Eighteenth Century. Three credit hours. Autumn Quarter. Mr. Mahr.

A study of the rise of Enlightenment in Germany, with special emphasis on Lessing and Schiller.

612. Goethe's Faust. Three credit hours. Winter Quarter. Mr. Blume.

The history of the Faust legend from the Sixteenth Century to Goethe. Reading and discussion of the drama.

613. Goethe's Life and Works. Three credit hours. Spring Quarter. Mr. Seidlin.

The development of Goethe's art and personality. His significance for modern times.

1955-1956:

614. German Romanticism. Three credit hours. Autumn Quarter. Mr. Seidlin.

The romantic revolt against the ideals of classical humanism. Novalis, the Schlegels, Tieck, Kleist, Eichendorff, E. T. A. Hoffman.

615. German Literature of the Nineteenth Century. Three credit hours. Winter Quarter. Mr. Mahr.

Social and literary forces in Germany from the death of Goethe to the founding of the German Reich.

616. Contemporary German Literature. Three credit hours. Spring Quarter. Mr. Blume.

The main currents of German thought and literature from Nietzsche to the present. Special emphasis on Hauptmann, Rilke and Thomas Mann.

617. Survey of German Literature. Three credit hours. Spring Quarter. Given in alternate years. Mr. Mahr.

An historical survey of German literature from Luther to the present, especially for majors in the senior year.

†**650. Proseminar.** Three credit hours. Summer Quarter.

Topic for 1955: The Dramatic Works of Grillparzer. Mr. Seidlin.

656. Introduction to the Historical Study of German. Three credit hours. Winter Quarter. Given biennially, alternating with 801, 805, 810. General prerequisites must include six Quarters of German or equivalent. Mr. Sperber, Mr. Fleischhauer.

Survey of the history of the German language. Relations between German and English phonology. History of words and meanings.

673. Elementary Middle High German. Three credit hours. Autumn Quarter. Given biennially, alternating with 801, 805, 810. Mr. Fleischhauer.

Introduction to the study of Middle High German with the reading of easy texts.

***676. Introduction to Sixteenth and Seventeenth Century German Literature.** Three credit hours. Spring Quarter. Given in alternate years. General prerequisites must include six Quarters of German or the equivalent.

A study of the language and literature of the Sixteenth and Seventeenth Centuries. Readings from Luther, Hans Sachs, Fischart, the *Vokabücher* selections from Seventeenth Century authors. Lectures and discussions on their contribution to the German language and literature.

685. Advanced Composition. Three credit hours. Spring Quarter. Three hours lecture and quiz each week. General prerequisites must include at least six Quarters of German. Mr. Fleischhauer.

An advanced course in speaking and writing German, accompanied by a review of German syntax.

***691. Practical German Pronunciation.** Two credit hours. Winter Quarter. Given biennially. Two hours lecture and drill each week. General prerequisites must include six Quarters of German or equivalent. Mr. Fleischhauer.

The formation of German sounds. A systematic study of the standard of German pronunciation and its chief variations. Oral and written drill. For majors, especially those who expect to teach the language.

NOTE: TEACHING COURSES. For the Teaching Course in this department see the Department of Education, Course 690.

701. Minor Problems. Two to ten credit hours. Autumn, Winter, and Spring Quarters. Open only on permission of the department. Mr. Blume, Mr. Mahr, Mr. Sperber, Mr. Fleischhauer, Mr. Seidlin, Mr. Wonderley.

Investigation of minor problems in the various fields of German literature and philosophy.

***705. Introduction to the Study of Language.** Three credit hours. Spring Quarter. Three lectures each week. Mr. Sperber, Mr. Fleischhauer.

The elements of linguistics, with especial emphasis on semantics, together with an outline of the Indo-European family of languages.

706. Elements of Semantics. Three credit hours. Spring Quarter. Given biennially, alternating with German 705. Mr. Sperber.

Studies in the history of words and the development of their meaning.

† Not given during the academic year, 1954-1955.

* Not given in 1954-1955.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

***801. Advanced Middle High German.** Three credit hours. Autumn Quarter. Given biennially, alternating with 656 and 673. Mr. Sperber.

The reading of more difficult Middle High German texts. Methods of textual criticism.

***805. Gothic and Old High German I.** Three credit hours. Winter Quarter. Given biennially, alternating with 656 and 673. Mr. Sperber.

***810. Gothic and Old High German II.** Three credit hours. Spring Quarter. Given biennially, alternating with 656 and 673. Mr. Sperber.

821-822-823. History of German Literature. Three credit hours. Autumn, Winter, and Spring Quarters. Given biennially. General prerequisites must include graduate standing. Mr. Mahr, Mr. Sperber, Mr. Seidlin.

This course is intended primarily to afford first-year graduate students an opportunity for wide reading in the general field of German literature or for intensive reading in specific periods. Informal discussion and written reports.

860. Seminar in German Literature. Five credit hours. Autumn, Winter, and Spring Quarters. Mr. Blume, Mr. Mahr, Mr. Seidlin.

Autumn Quarter: *Übungen zum deutschen Drama des 20. Jahrhunderts.* Mr. Blume.

Winter Quarter: *Übungen zum Barock.* Mr. Seidlin.

Spring Quarter: *Sturm und Drang.* Mr. Mahr.

870. Seminar in German Linguistics. Three credit hours. Autumn, Winter, and Spring Quarters. Mr. Sperber, Mr. Fleischhauer.

Ausgewählte Gegenstände aus den Gebieten der Wortgeschichte, der Stilforschung und der Sprachpsychologie.

950. Research in German. Autumn, Winter, and Spring Quarters. Mr. Blume, Mr. Mahr, Mr. Sperber, Mr. Fleischhauer, Mr. Seidlin, Mr. Wonderley.

GREEK LANGUAGE AND LITERATURE

(See Classical Languages and Literature)

HISTORY

Office, 211 University Hall

PROFESSORS DULLES, SIEBERT (EMERITUS), McNEAL (EMERITUS), HOCKETT (EMERITUS), DORN, McDONALD, WOODRING, ROSEBOOM, WEISENBURGER, SIMMS, HILL, AND RAGATZ, ASSOCIATE PROFESSORS FISHER, MORLEY, AND VARG, ASSISTANT PROFESSORS HARE, WALTERS, BRENNER, COLES, AND GOLDBERG

REQUIREMENTS FOR THE DEGREE DOCTOR OF PHILOSOPHY

All candidates for the degree Doctor of Philosophy in history are required to have had History 812A or 812B or the equivalent of either, and are required to take History 813 and History 814, and at least four seminars in history, of which two must be in the field of European history and two in the field of American history.

Candidates should read the general requirements for the Ph.D. degree as given on page 45.

A. Notice of Candidacy. Students who expect to become candidates for the degree Doctor of Philosophy in history should make their intentions known not later than the beginning of the first Quarter of the second year of graduate work.

From the list below, each student will select in consultation with his advisory committee five fields of history and one field of allied knowledge in which he proposes to undergo examination. Three of the history fields may be selected from Group A and two from Group B or three may be selected from Group B and two from Group A. One of the fields of history shall be designated as the dissertation field. The sixth field must be selected from Group C.

* Not given in 1954-1955.

B. Fields of Choice:**GROUP A**

Ancient Oriental and Greek History
 Roman History
 The Middle Ages including English History to 1485
 Renaissance and Reformation, 1300-1643
 European History, 1648-1815
 European History, 1789-1870
 European History since 1870
 The Expansion of Europe
 The History of England, 1485-1763
 The History of England since 1763
 The Near East

GROUP B

The Colonial History of the United States
 Political and Social History of the United States, 1789-1850
 Political and Social History of the United States, 1850-1900
 Political and Social History of the United States since 1900
 The Slavery Controversy and the Post-Bellum South
 The Constitutional History of England and the United States
 United States Foreign Relations
 Latin America

GROUP C

An approved field, normally in anthropology, economics, political science, philosophy, literature, or some other allied subject
 By special arrangement, approved by the Graduate Committee of the Department, other appropriate fields may be substituted for those indicated above.

C. Foreign Languages. Except in special cases, a reading knowledge of French and German is required of every candidate for the degree Doctor of Philosophy in history. In exceptional cases, the department may approve the substitution of another language for either French or German. In such cases the language selected as a substitute must have a clear bearing upon the candidate's field of research.

Graduate students working toward the Ph.D. degree in history are expected to satisfy their foreign language requirements as early in their graduate careers as possible in order to meet the qualitative standards of effective graduate work. The formal test in at least one language must be met during the first Quarter in which the student is working toward the Ph.D. degree and the second test not later than the fourth Quarter.

D. The General Examination. The candidate will be required to pass examinations in all five of the selected fields of history and in the allied field.

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

As applied in History for any 600 or 700 group subject, prerequisites include at least four Quarter courses in the social science field, of which at least two must be in history.

See page 76 for the program in Ancient History and Literature.

607. The Renaissance. Three credit hours. Winter Quarter.

The Renaissance primarily as an Italian movement. The political evolution of the Italian communes into city republics, with special emphasis on Florence, Milan, Venice, Genoa, and Rome; early capitalism and industrial and commercial movements; an analysis of the culture, art, science, and literature of the Renaissance and their influence upon the Church, the Papacy, and modern modes of thought and behavior. Lectures, readings, reports, and discussions.

608. The Reformation. Five credit hours. Spring Quarter.

The Church and European society in the later Middle Ages; culture and thought in the age of the Reformation; the rise of the European state system; Luther and the German National movement; Zwingli and Switzerland; Calvin; the expansion of Protestantism in Europe; and the relation of the Reformation to medieval and modern civilization. Lectures, readings, reports, and discussions.

611. Constitutional History of England (to 1485). Three credit hours. Autumn Quarter. General prerequisites must include History 682 or consent of the instructor. Given in alternate years. Mr. Woodring.

The development of an effective royal administration, the rise of common law and a national system of courts, the dawn of representative institutions, the completion of basic institutions and the tradition of constitution by 1485. Lectures, textbook, source problems, collateral readings.

612. Constitutional History of England (since 1845). Three credit hours. Winter Quarter. General prerequisites must include History 611 or consent of the instructor. Given in alternate years. Mr. Woodring.

The Tudor system, the struggle between king and parliament, cabinet government, electoral reform, and the law of the modern constitution. Lectures, textbook, source problems, collateral readings.

617. Europe, 1660-1789. Five credit hours. Autumn Quarter. Mr. Dorn.

This course offers a study of the transformation of feudal society into the modern absolute state in its social, economic and constitutional aspects, as exemplified in France, Spain, Austria, Prussia, and Russia. Special emphasis will be placed on France under Louis XIV, on the evolution of Prussia and Russia, the changing diplomatic alignments of the principal European Powers from 1660 to 1789, on the intellectual enlightenment of the Eighteenth Century and on Enlightened Despotism. Readings, discussions, and reports.

619. Medieval Civilization. Three credit hours. Autumn Quarter.

The formation of feudal society; culture of castle and court; the rise of towns and their social and economic life; the evolution of the Medieval Church and its educational and artistic contributions. Lectures, readings, problems, and class discussion.

620. Europe, 1815-1871. Three credit hours. Autumn Quarter. Mr. Ragatz.

Nationalism, the democratic movement, economic growth, imperialism and cultural advance in the Old World from the Congress of Vienna to the close of the Franco-Prussian War.

*621. The Expansion of Europe. Three credit hours. Autumn Quarter. Mr. Ragatz.

The Old Colonial Empires. The age of exploration and discovery and European colonizing activities in the Americas, Africa and Asia to 1825.

622. The Expansion of Europe. Three credit hours. Autumn Quarter. Mr. Ragatz.

Africa and the Western World in the 19th and 20th Centuries. Economic penetration, the conflict of cultures, political developments and social advance.

623. The Expansion of Europe. Three credit hours. Winter Quarter. Mr. Ragatz.

Asia, the Pacific Basin and the Western World in the 19th and 20th Centuries. The quest for markets, the rise and decline of colonialism and contemporary problems in these critical areas.

624. The French Revolution and Napoleon. Five credit hours. Winter Quarter. Mr. Goldberg.

The economic, social, and ideological background of the Revolution; the social bases and political schisms of the first three Revolutionary governments, 1789-1795; the impact of international war; the program and role of Napoleon; Napoleon over Europe. Textbook, lectures, and research papers.

*625. France since 1815. Three credit hours. Spring Quarter. Mr. Goldberg.

The social and economic evolution of France, 1815-1870; the founding of the Third Republic; the evolution of French politics and social classes, 1870-1914; the problems and crises of France between two wars; the Fourth Republic. Lectures, readings, and research papers.

*626. The Rise of Islam and the Spread of Moslem Civilization. Three credit hours. Autumn Quarter. Mr. Fisher.

A study of the Arab world at the time of Mohammed; his teachings and the spread of the Moslem faith; the Umayyad and Abbasid Empires; the Crusades; Islamic culture and learning, and their decline under the Mongols and Turks. Terminal date, 1517.

627. The Rise and Fall of the Ottoman Empire. Three credit hours. Autumn Quarter. Mr. Fisher.

A study of the relationship between East and West from the Thirteenth Century to the close of the First World War.

628. The Near East since 1914. Three credit hours. Spring Quarter. Mr. Fisher.

* Not given in 1954-1955.

A study of the conflicting national and international problems following the collapse of the Ottoman Empire; the development of the Turkish Republic; the enlarged Balkan states; the mandates; Zionism and Arab aspirations; World War II; and present USSR and USA interest in the area.

629. Modern Germany (1789-1939). Three credit hours. Winter Quarter. Mr. Dorn.

Introductory lectures on the basic problems and tendencies of German history; Germany and the French Revolution; German Enlightenment and Romanticism and their relation to political thought; the Stein-Hardenberg reforms and the war of liberation; Prussia, Austria and the problem of German unity; the nationalist and democratic movements; the Bismarckian Empire; industrial development; William II and the First World War; the Treaty of Versailles; the Weimar Republic; and the National Socialist Regime. Lectures, readings, reports, and discussions.

630. The European State System (1871-1920). Three credit hours. Spring Quarter. Mr. Dorn.

An analysis of the evolution of the state system in Europe in the classic period of national and imperialistic power politics. While economic and cultural forces common to the whole of Europe will be studied, emphasis will be on international relations from the Franco-Prussian War through the Paris Peace Conference of 1919. Lectures, readings, reports, and discussions.

631. Constitutional History of the United States (to 1876). Three credit hours. Winter Quarter. General prerequisites must include a minimum of two Quarter courses in history, in which the emphasis must be upon the history of the United States. Mr. Dulles.

Constitutional problems involved in the struggle for independence, establishment of the national government, the growth of democracy, the slavery controversy, and the Civil War. Lectures, readings and discussions.

632. Constitutional History of the United States (since 1876). Three credit hours. Spring Quarter. General prerequisites must include History 631. Mr. Dulles.

Constitutional problems arising from the growth of capitalism, the organization of labor, territorial expansion, the First World War and New Deal reforms. Lectures, readings, and discussions.

633. The Slavery Controversy in the United States. Three credit hours. Autumn Quarter. Mr. Simms.

The origins of the institution of slavery; the social system of the Old South; the psychological, economic, political, and constitutional implications of the controversy; secession, the appeal to arms and the impact of war upon life north and south. Lectures, readings, and discussions.

634. Reconstruction and the New South (1863 to the Present). Three credit hours. Winter Quarter. Mr. Simms.

The controversy over Reconstruction plans; the triumph of the industrial order; the social and economic readjustments in Southern States during and after Reconstruction. Lectures, readings, and discussions.

635. American Foreign Policy to the Close of the Civil War. Three credit hours. Autumn Quarter. Mr. Hill.

The foreign relations of the United States, beginning with the diplomacy which resulted in the establishment of independence and including such subjects as the struggle for neutral rights and commercial recognition, the extension of territory on the North American continent, the origin of the Monroe Doctrine, and the international controversies of the Civil War. Lectures, discussions, and reports.

636. American Foreign Policy since the Civil War. Five credit hours. Winter Quarter. Mr. Hill.

Problems in the diplomacy of the United States resulting from the Civil War, the development of the Monroe Doctrine, the acquisition of dependencies, relations with Latin America and the Orient, arbitration, the Isthmian Canal, and the two World Wars. Lectures, discussions, and reports.

639. The Influence of Immigrant Groups upon United States History. Five credit hours. Spring Quarter. Mr. Weisenburger.

The share of different immigrant groups in the building of the nation, from the colonial period to the present; with special emphasis on the influence of immigration upon American political, economic, social, and cultural development. Lectures, readings, and discussions.

641. The Westward Movement since 1873. Five credit hours. Winter Quarter. Mr. Roseboom.

This course is a continuation of History 644 but may be taken separately. It deals broadly with the westward spread of settlement since 1788, emphasizing such topics as land policies, transportation and trade, Indian relations, sectionalism, frontier social and intellectual life, and the effects of the westward movement on American development.

643. Political Parties in the United States. Five credit hours. Spring Quarter. Mr. Roseboom.

The radical party of the Revolution; the origin and growth of national parties; the slavery issue in party politics; the effect of the Civil War upon parties; party development in recent American history, special attention being devoted to the influence of the new economic and social conditions in creating new parties and policies.

644. The American Colonies and the American Revolution. Five credit hours. Autumn Quarter. Mr. Roseboom.

This course deals with the transplanting of European culture and institutions to North America, the resultant international rivalries, the westward spread of English settlement, and the causes and course of the American Revolution in its political, social, economic, and military aspects. For a continuation of this course see History 641.

***645. Latin America. Three credit hours. Autumn Quarter. Mr. Hill.**

The European background; native cultures of the New World; conquest and settlement; political, social, and economic institutions; the wars for independence. This course affords a natural introduction to History 646. Lectures, readings, and discussions.

646. Latin America. Five credit hours. Winter Quarter. Mr. Hill.

The evolution of the A B C powers, with minor consideration of the other republics of South America; major problems of an inter-American and an international nature. This course is a logical continuation of History 645. Lectures, readings, and discussions. For a continuation of this course, see History 679.

***649. Greek Civilization. Three credit hours. Winter Quarter. Given in alternate years. Mr. McDonald.**

The Hellenistic Age: A study of Greek institutions from the accession of Alexander the Great to the period of the Roman conquest. Readings in the sources in translation.

***650. Roman Civilization. Three credit hours. Autumn Quarter. Given in alternate years. Mr. McDonald.**

A study of the institutions of the Early Roman Empire, beginning with the Augustan Age, and ending with the death of Marcus Aurelius. Readings in the sources in translation.

653. The Ancient History of the Near East. Three credit hours. Spring Quarter. Given in alternate years. Mr. McDonald.

The ancient history of Egypt, Babylonia, Assyria, and adjacent cultures. Readings in the sources in translation.

655. Greek History. Five credit hours. Autumn Quarter. Mr. McDonald.

A history of Greece from the early Minoan period to the age of Demosthenes and Philip of Macedon. Readings in the Greek historians in translation.

656. Roman History. Five credit hours. Winter Quarter. Mr. McDonald.

A history of Rome from the early Bronze Age to the fall of the Roman Republic. Readings in the Roman historians in translation.

668. The Emergence of Modern America, 1865-1898. Five credit hours. Spring Quarter. Mr. Weisenburger.

An intensive study of the political, social, and cultural transformation of the United States in the late Nineteenth Century.

676. History of Modern Russia. Five credit hours. Winter Quarter. Mr. Morley.

This course is designed to acquaint the student with the major developments in modern and contemporary Russia. The early period down to the Nineteenth Century will be treated in broad outline. Emphasis will be given to the changes in Russia during the last century which laid the basis for the revolutions and the rise of Soviet civilization.

677. Soviet Russia. Three credit hours. Spring Quarter. Mr. Morley.

* Not given in 1954-1955.

This course continues the history of Russia from the March Revolution to the present time. It attempts the historical analysis of the March and November Revolutions, foreign intervention and civil war, the economic situation, the five year plans, foreign affairs, and the present situation after the Second World War.

***678. Modern Poland.** Three credit hours. Spring Quarter. Given in alternate years. Mr. Morley.

Dealing primarily with the period since 1918, this course emphasizes those problems in Poland which were typical of the Succession States and analyzes Poland's transformation under the impact of Communism. Several background lectures are devoted to the partitions of Poland and to her struggle for independence during the Nineteenth Century.

679. Latin America. Five credit hours. Spring Quarter. Mr. Hill.

A study of the republics of Middle America, with major emphasis on Mexico. This course is a logical continuation of History 645 and 646. Lectures, readings and discussions.

***682. History of England, Medieval Period (to 1485).** Three credit hours. Autumn Quarter. Given in alternate years. Mr. Woodring.

History 682, 683, and 684 constitute an interdependent sequence in which the history of England and Greater Britain, socially considered, is rapidly surveyed from the earliest times to our own day. The aim of the course is to give a connected narrative, in terms of social, economic, and political conditioning, expressed in terms of historic personalities. Particularly, the necessary background for the student of English literature and of law will be furnished. The student will be introduced to a wide range of books, both historical and literary. Graduate students will be required to synthesize their readings into a written report.

683. History of England, Tudor and Stuart Periods (1485-1714). Three credit hours. Autumn Quarter. General prerequisites must include History 682 or consent of the instructor. Mr. Woodring.

684. History of England, Hanoverian and Modern Period (1714-1900). Three credit hours. Winter Quarter. General prerequisites must include History 683 or consent of the instructor. Mr. Woodring.

686. Contemporary England. Three credit hours. Spring Quarter. Mr. Poirier.

Victorian England in its economic, political, and cultural phases transformed by imperialism, the two World Wars, and the rise of new class theory and organization. Lectures, readings, reports, and informal discussions.

689. The History of Ohio. Three credit hours. Autumn Quarter. Mr. Weisenburger.

A general survey of state history—social, economic, religious, and political—from the Indian period to the present time.

692. Liberalism and Conservatism in Twentieth Century American History. Five credit hours. Spring Quarter. Mr. Bremner.

An historical interpretation of intellectual and cultural trends in the United States since 1900, emphasizing their interrelationship with social and political developments. Lectures, readings, reports, discussions.

700. Minor Problems in History. One to three credit hours. Autumn, Winter, and Spring Quarters. Open by permission of the instructor.

The course consists of individual study in some field of historical development and is designed to allow the student to work upon a problem in which he is particularly interested.

737. Recent History of the United States (1898-1928). Five credit hours. Autumn Quarter. Mr. Dulles.

The impact of modern industrialism upon American imperialism, society, government, and foreign policy. Laissez-faire and government regulation, the Progressive movement, and the First World War.

Lectures will be given concurrently with History 537 on Mondays, Wednesdays, and Fridays. Group meetings on Tuesdays and Thursdays for special discussions and reports.

738. Recent History of the United States (since 1928). Five credit hours. Winter Quarter. Mr. Dulles.

* Not given in 1954-1955.

A continuation of History 787, but may be taken separately. Prosperity and depression, the New Deal, the United States in international affairs, the Second World War.

Lectures will be given concurrently with History 538 on Mondays, Wednesdays, and Fridays. Group meetings Tuesdays and Thursdays for special discussions and reports.

790. Contemporary Europe (1920 to the Present). Five credit hours. Winter Quarter. Mr. Dorn.

While covering the same ground as History 590, this course aims at an advanced and intensive study and places its emphasis on methods of historical research and document analysis.

Lectures will be given concurrently with History 590 on Mondays, Wednesdays, and Fridays. Group meetings on Tuesdays and Thursdays for special discussions and reports.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

These prerequisites include acceptable foundation courses of collegiate grade in European and American history, economics and political science.

809. Seminar in European History. Three credit hours. Autumn Quarter. History 812B must be included in the general prerequisites or taken concurrently. Mr. Woodring.

Research topic: To be announced.

***810. Seminar in European History.** Three credit hours. Autumn Quarter. History 812B must be included in the general prerequisites or taken concurrently.

811. Seminar in European History. Three credit hours. Winter Quarter. History 812B must be included in the general prerequisites or taken concurrently. Mr. McDonald.

Research topic: To be announced.

812A. Introduction to Historical Research in American History. Three credit hours. Autumn Quarter. Required of candidates for the Master's degree in the American History field. Mr. Weisenburger.

A practice course dealing with the problems involved in the preparation of the Master's thesis. Should be taken during the student's first Quarter in the Graduate School.

812B. Introduction to Historical Research in European History. Three credit hours. Autumn Quarter. Required of candidates for the Master's degree in the European History field.

A practice course dealing with the problems involved in the preparation of the Master's thesis. Should be taken during the student's first Quarter in the Graduate School.

813. Great European Historians. Three credit hours. Autumn Quarter. Required of candidates for the Doctor's degree. Mr. Dorn.

A study of the leading historical writers and schools of Europe, with selected readings from representative writers.

814. Great American Historians. Three credit hours. Spring Quarter. Required of candidates for the Doctor's degree. Mr. Simms.

A study of the leading American writers and schools of history.

***815. Seminar in European History.** Three credit hours. Winter Quarter. Either History 812A or 812B must be included in the general prerequisites.

816. Seminar in European History. Three credit hours. Spring Quarter. Either History 812A or 812B must be included in the general prerequisites. Mr. Dorn.

Research topic: To be announced.

***817. Seminar in European History.** Three credit hours. Winter Quarter.

* Not given in 1954-1955.

***819-*820. Two-Quarter Seminar in American History.** Six credit hours. Autumn and Winter Quarters. History 812A must be included in the general prerequisites. Permission of the instructor is required. No credit will be given until the two Quarters have been completed.

821. Seminar in American History. Three credit hours. Autumn Quarter. History 812A must be included in the general prerequisites or taken concurrently. Mr. Hill.

Research topic: To be announced.

822. Seminar in American History. Three credit hours. Winter Quarter. History 812A must be included in the general prerequisites or taken concurrently. Mr. Simms.

Research topic: To be announced.

823. Seminar in American History. Three credit hours. Spring Quarter. History 812A must be included in the general prerequisites or taken concurrently. Mr. Roseboom.

Research topic: To be announced.

***824. Seminar in American History.** Three credit hours. Winter Quarter. History 812A must be included in the general prerequisites or taken concurrently.

950. Research in History. Autumn, Winter, and Spring Quarters. Open by permission of the chairman of the department.

This course is to be used only for the Master's thesis and for work on the doctoral dissertation.

HISTORY OF EDUCATION

(See Education)

HOME ECONOMICS

Office, 220 Campbell Hall

PROFESSORS BRANEGAN, GILMORE, HEYE, LEHMAN, MCGINNIS, NEWARK, PATTON, AND SCOTT, **ASSOCIATE PROFESSORS** BANCROFT, DAVIS, KENNEDY, LEWIS, PRESSEY (EMERITUS), PRUDENT, WEAVER, AND WOOD, **ASSISTANT PROFESSORS** BEARD, GREEN, HARGER, HOEFLIN, KYLE, LLOYD, RYAN, TAPSCOTT, TURNBULL, AND WARFIELD, MRS. HENDRICKSON, AND MRS. MESSIER

Graduate Work in Home Economics: A graduate education and research committee, including the Director of the School of Home Economics, is responsible for the internal graduate affairs of the School of Home Economics and for the relations between the School of Home Economics and the office of the Graduate School.

General Information: The School of Home Economics offers work leading to the Master of Arts in Home Economics Education and to the Master of Science degree in eight areas.

- | | |
|-----------------------------|---------------------------|
| 1. Child Development | 5. Hospital Dietetics† |
| 2. Food and Nutrition | 6. Household Equipment |
| 3. Home Economics Education | 7. Institution Management |
| 4. Home Management | 8. Textiles and Clothing |

Work leading to the Doctor's degree is available at present in two areas.

1. Foods and Nutrition
2. Home Economics Education

Admission to Graduate Work. Admission to graduate work in home economics is dependent upon certain qualifying conditions. These conditions are:

1. A bachelor's degree in home economics from an accredited college, with a satisfactory record. (A possible exception to the requirement of a home economics degree might be made if the major undergraduate field was closely allied to home economics.)

† In cooperation with the University Hospital, an opportunity is given for dietetic interns and graduate dietitians to schedule a sequence leading to the Master's degree.

* Not given in 1954-1955.

2. A cumulative point-hour ratio (grade average) of 2.5 in all undergraduate work with an average of 2.7 in the major field. (These averages are based on a 4-point value for a mark of A.)
3. At least 45 Quarter hours in home economics for all graduates in this field. The distribution of home economics hours will be appraised by the School of Home Economics in terms of the student's graduate interest.
4. At least 12 Quarter hours in social sciences.
5. At least 12 Quarter hours in physical and/or biological science.
6. Adequate background course work in the area of home economics in which the advanced degree is sought and in closely allied subjects.

The Master's Degree Program

1. All new students after admission to the Graduate School must report to the Director of the School of Home Economics, Room 220, Campbell Hall for the assignment of an adviser.
2. An advisory committee is appointed by the Director on the recommendation of the adviser and the student. This committee shall be set up during the student's first or second Quarter of residence and shall consist of two or three members one of whom shall be either from an area in home economics outside the student's major interest, or from a related department in the University.
3. The advisory committee interviews the student when approximately one-third of the work for the degree is completed. This Qualifying Interview is for the purpose of determining the student's status in the School of Home Economics and to discuss the program and thesis proposed by the student to meet the requirements of this degree.
4. The thesis shall be supervised by the graduate adviser, subject to consultation with the advisory committee from time to time.

The Doctor of Philosophy Degree Program in Home Economics

1. All new students after admission to the Graduate School must report to the Director of the School of Home Economics, Room 220, Campbell Hall for the assignment of an adviser.
 2. The advisory committee consists of the adviser and two other members, one of whom shall be from a related department. The chairman shall be from the student's division of specialization.
 3. The advisory committee considers whether or not it is advisable for a student to work toward this degree. This recommendation will be based on the student's record and a preliminary advisory conference conducted by the advisory committee not later than the second Quarter of residence.
 4. The program of study must be approved by the advisory committee.
 5. General examinations (written and oral) must be taken in areas of specialization approved by the advisory committee. Students in food and nutrition shall take examinations in the fundamentals of foods and nutrition and in at least two related areas. Students in home economics education shall take general examinations in not less than three areas of specialization which must be distributed in the fields of home economics education, home economics subject matter and education or psychology.
 6. Students interested in home economics and education should register with one or the other department and request a preliminary advisory committee representing Home Economics Education and Education. This committee will inform the student of the plan for the administration of this Ph.D. program. Students with this combined interest follow one of two plans:
- Plan I. The student's program, general examination and dissertation will be administered and directed in the department which the preliminary advisory committee and the student believe will best serve her interests.
- Plan II. The total Ph.D. program for the student will be the joint responsibility of the two departments.
7. The dissertation program and plan must be approved by the advisory committee but will be directed by the adviser.

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

601. Clothing. Three credit hours. One Quarter. Autumn, Winter and Spring. Two three-hour laboratory periods each week. General prerequisites must include an elementary course in clothing. Miss Gilmore, Miss Ryan.

This course includes the application of the principles of tailoring. The laboratory work consists of the making of a suit or coat.

***604. Clothing.** Three credit hours. Spring Quarter. Three two-hour laboratory periods each week. General prerequisites must include an elementary course in clothing, or consent of instructor. Miss Gilmore, Miss Ryan.

* Not given in 1954-1955.

The function of this course is to provide opportunity for creative work in draping. The laboratory work includes handling a variety of fabrics, using historical and contemporary design sources and experimenting with finishing techniques for different fabrics and different designs.

610. Nutrition. Three credit hours. Winter Quarter. Three one-hour class meetings each week. General prerequisites must include courses in food, nutrition, agricultural biochemistry, and physiology. Miss Lincoln.

A consideration of recent human nutrition studies as they relate to modern concepts of nutrition.

612. Nutrition: Diet Therapy. Five credit hours. Spring Quarter. Three two-hour class meetings each week; other hours to be arranged. General prerequisites must include courses in basic nutrition, agricultural biochemistry, and physiology. Mrs. Prudent.

Study of modern concepts of clinical nutrition in connection with abnormal conditions in which diet is an important part of the treatment.

615. Experimental Work in Food Preparation. Five credit hours. Autumn Quarter. Two one-hour class meetings and three three-hour laboratory periods each week. General prerequisites must include courses in foods and agricultural biochemistry. Miss Green.

The application of experimental methods to problems involved in the preparation of foods.

616. Nutrition of Infants and Children. Three credit hours. Spring Quarter. Three class meetings each week. General prerequisites must include a course in agricultural biochemistry and a course in basic nutrition. Mrs. Lewis, Mrs. Prudent.

The nutritional needs of children from prenatal life through adolescence and the methods of evaluating the nutritional status of children.

***617. Foods: Preservation in the Home.** Three credit hours. Alternate Summers. One one-hour class meeting and two two-hour laboratory periods each week. General prerequisites must include a course in microbiology in relation to man and fifteen hours of food and nutrition. Miss Green, Mrs. Prudent.

This course covers the theory and practice of home methods of food preservation including dehydrating, brining, and pickling as well as canning and freezing.

619. Household Equipment. Three credit hours. Autumn Quarter. Two one-hour class meetings and one two-hour laboratory period each week. General prerequisites must include a course in household equipment. Miss Beard.

Application to home and school situations of recent developments in lighting, with special emphasis on selection, care, and use of lighting equipment.

622. Household Equipment: Performance Testing. Five credit hours. Winter Quarter. Two one-hour class meetings and three two-hour laboratory periods each week. General prerequisites must include a course in household equipment, fifteen Quarter credit hours in natural science, and twenty additional Quarter credit hours in home economics. Miss Davis.

Experimental problems on the performance of the major types of household equipment used in preparation of food.

623. Household Equipment: Performance Testing. Five credit hours. Winter Quarter. One two-hour class meetings and two three-hour laboratory periods each week. General prerequisites must include elementary courses in Home Economics, and five Quarter credit hours in Bacteriology. Industrial Engineering 720 is recommended as preceding or concurrent. Mrs. Weaver.

The course provides experience in the techniques and reporting of experimental investigations dealing with household equipment used in laundering and other cleaning processes.

627. Laboratory in Home Management. Five credit hours. One Quarter. Autumn, Winter, Spring. Five hours of group conference and scheduled laboratory each week, and other laboratory hours to be arranged. Each student

* Not given in 1954-1955.

electing the course should report to Room 211, Campbell Hall, to make application and to check for eligibility, at least two Quarters in advance. Limited facilities prevent opening this course to out-of-state students not regularly enrolled for an undergraduate degree. General prerequisites must include courses in food preparation, nutrition, child development, home management, household equipment, or home furnishings. Miss Lloyd, Miss Newark.

An application of the principles presented in other courses. Each student is provided with an opportunity to study the management of one or more homes, the needs of the student being considered.

*628. **Selection of Furnishings for the Home.** Three credit hours. Winter Quarter. Two one-hour class meetings and one two-hour laboratory period each week. General prerequisites must include elementary courses in economics and a course in home furnishing. Miss Warfield.

A study of the consumers' problems in the selection of home furnishings. Field trips are arranged.

630. **Food and Equipment Buying for Institutions.** Four credit hours. Autumn Quarter. Three class hours and one two-hour laboratory period each week. General prerequisites must include forty Quarter-credit hours in home economics. Students in Restaurant Management curricula will be admitted upon completion of a minimum of fifteen Quarter-credit hours in foods, nutrition, and institution management. Miss Harger, Miss Wood.

A study of market practices from the viewpoint of buying food and equipment for institution food services, including detailed consideration of quality, characteristics, wholesale purchase units in relation to needs and costs, and the writing of specifications.

631. **Quantity Cookery.** Four credit hours. One Quarter. Autumn, Winter, Spring. Two class hours and eighteen laboratory hours each week for one-half Quarter. General prerequisites must include forty Quarter-credit hours in home economics. Students in Restaurant Management curricula will be admitted upon completion of a minimum of fifteen Quarter credit hours in foods, nutrition and institution management. Home Economics 630 is a preceding or concurrent course. Students should plan to schedule this course concurrently with Home Economics 627. Miss Kyle.

Experience in use of large equipment and application of principles of cookery to quantity preparation, standardized formulae, and costs.

632. **Institution Organization and Administration.** Five credit hours. Spring Quarter. Three one-hour class meetings and six hours laboratory to be arranged. General prerequisites must include forty Quarter-credit hours in home economics including Home Economics 630 and 631. Students in Restaurant Management curricula will be admitted upon completion of a minimum of fifteen Quarter-credit hours in foods, nutrition, and institution management. Miss Harger, Miss Wood.

A study of the principles of business organization and management applied to the problems of feeding institution groups. Supervised experience in meal service.

†633. **School Lunchroom Management.** Three credit hours. Summer Quarter. Three class meetings each week and one hour to be arranged. General prerequisites must include three courses in Foods and Nutrition and one course in Institutional Management or the equivalent, and permission of the instructor.

A general course on management problems in a school lunch program.

634. **Sanitation for Food-Serving Establishments.** Three credit hours. Spring Quarter. One one-hour and one two-hour class meetings each week. General prerequisites must include a course in microbiology in relation to man or a course in general bacteriology. Miss Wood.

Application of the principles involved in sanitary food handling. Consideration of practical problems which are concerned with protection of health and with prevention of food spoilage and contamination.

† Not given during the academic year, 1954-1955.

* Not given in 1954-1955.

635. Recent Developments in Food and Nutrition Research. Three credit hours. Spring Quarter. Three class meetings each week. General prerequisites must include courses in food preparation and family nutrition. Mrs. Prudent.

This course considers the recent important contributions of research relative to food and nutrition.

661. Child Development. Three credit hours. One Quarter. Autumn, Winter, Spring. Two class meetings each week and four morning hours to be arranged. Each student electing the course must report to Room 220, Campbell Hall, to make application and to arrange hours for Nursery School Laboratory. General prerequisites must include an introductory course in child development, and fifteen Quarter-credit hours of social science. Students not majoring in home economics may, with the consent of the instructor, substitute other courses related to the study of young children and family relations. Miss Hoeflin, Miss Johnston.

Application to the principles of child development to actual work with pre-school children. Appropriate guidance techniques will be discussed and applied.

***662. Child Development.** Three credit hours. Spring Quarter. Two one-hour class meetings and two one-hour observation periods. General prerequisites must include an introductory course in child development. Miss Heye.

This course considers methods of evaluating the growth of children, techniques for measuring growth over a period of time, and ways in which growth can be directed.

663. Infant Guidance and Care. Three credit hours. Spring Quarter. Two one-hour class meetings and one two-hour laboratory period to be arranged. General prerequisites must include courses in Foods and Nutrition, Child Development, and Bacteriology. Miss Heye.

The course deals with the pattern of development during infancy and the second year of life, and the responsibilities of adults for providing a home environment favoring optimum development.

664. Nursery School Activities. Three credit hours. Autumn Quarter. Three one-hour class meetings and one one-hour laboratory period. Miss Heye.

The planning of group activities and experience for preschool children, and the evaluation of existing and proposed programs in relation to its contribution to the children, to recommended standards, and to the needs of the community.

670. Clothing: Fashion. Three credit hours. Winter Quarter. Three class meetings each week. General prerequisites must include ten hours in fine arts and home economics (textiles and clothing), and ten hours in economics, sociology or history. Miss Gilmore.

A study of the origin and development of the fashion movement and its relation to the manufacturing and consumption of textiles and clothing. An analysis of sources of current fashion information; of methods and practices used in style coordination; of fashion trends, and their effect on the markets and the consumer.

***671. Textiles.** Three credit hours. Winter Quarter. One one-hour class meeting and two two-hour laboratory periods each week. General prerequisites must include ten hours in home economics including textiles and ten hours of natural science. Miss Tapscott.

In this course, the student will gain experience in planning and conducting textile tests and in evaluating the resulting data. Fibers, yarns, fabrics, and finishing agents will be studied in relation to probable durability and serviceability. Some consideration will be given to the development, present status, and importance of textile testing.

672. Textiles: Historic. Three credit hours. Winter Quarter. Three class meetings each week. General prerequisites must include a course in textiles, a course in fine arts, and ten hours in social science. Miss Ryan.

The development of textiles from the prehistoric to the modern age. Correlation of design, production, and use. Contemporary cultural forces in relation to the evolution of textiles.

* Not given in 1954-1955.

673. Textiles: Recent Developments. Three credit hours. Spring Quarter. General prerequisites must include at least one home economics course concerned with the study of textiles. Miss Tapscott.

A study of recent developments and research in the field of textiles. Discussion and reports based on individual assignments.

681. Home Economics Extension Methods. Five credit hours. Winter Quarter. Four one-hour class meetings and one two-hour laboratory period each week, with opportunity for field observation. General prerequisites must include a general course in extension methods and consent of the instructor. Miss Warfield and Home Economics Extension staff.

This course is planned to give a knowledge of: Home economics extension methods, relationship of home economics extension to other educational movements, resources of the state, county and community.

No student may register for the course until she is fully admitted to the Teaching Curriculum by her Faculty Adviser.

701. Special Problems in Home Economics. One to five credit hours. Autumn, Winter and Spring Quarters. One conference or more each week. Consent of the instructor must be obtained. For Graduate students, problems must be in major or minor fields. The Graduate Staff.

Problems in various phases of home economics chosen for individual study. Groups will be organized as follows:

- (a) Problems in food preparation.
- (b) Problems in nutrition and dietetics.
- (c) Problems in textiles.
- (d) Problems in clothing.
- (e) Problems in home furnishing.
- (f) Problems in household equipment.
- (g) Problems in home management.
- (h) Problems in institution management, equipment, and food buying.
- (i) Problems in teaching home economics.
- (j) Problems of child development.
- (k) Problems in hospital dietetic administration and therapeutics.

***702. Supervision of Home Economics Teaching.** Three credit hours. General prerequisites must include Home Economics 741 or consent of the instructor. Miss Scott.

A course for experienced teachers of home economics who are interested in supervising student teachers or in working with home economics teachers in service.

705. Research Methods in Nutrition. Three credit hours. Autumn Quarter. One one-hour class meeting and two two-hour laboratory periods each week. General prerequisites must include courses in organic chemistry, quantitative analysis, and physiology. Mrs. Prudent.

A course planned to acquaint students with equipment and methods used in research studies in nutrition.

715. Introductory Food Research. Three credit hours. Spring Quarter. One one-hour class meeting and two three-hour laboratory meetings each week. General prerequisites must include Agricultural Biochemistry 601 or 607 and Home Economics 615. Agricultural Biochemistry 613 is recommended as a preceding or concurrent course. Mrs. Prudent.

This course is designed to study problems in food preparation, processing in the home as well as food storage, by a review of the literature and by experimentation in the laboratory.

731. Food Cost Analysis for Institutions. Three credit hours. Autumn Quarter. Two two-hour class meetings each week. General prerequisites must include Home Economics 632 or equivalent and a course in accounting or equivalent. Miss Harger.

A study of records used in large quantity foods service and house units and their use in budgeting and food cost control.

* Not given in 1954-1955.

740. Home Economics in American Education. Two credit hours. Autumn Quarter. General prerequisites must include a course in Principles and Methods of Teaching Applied to Home Economics, teaching experience in home economics, and consent of instructor. Miss Scott.

An overview of the field of home economics in American education at the elementary, secondary, higher education, and adult levels. General trend in enrollment, curriculum, and guidance, supervision, administration, and research as background for advanced work in home economics education.

†741. The Teaching of Home Economics. Three credit hours. Winter Quarter. General prerequisites must include teaching experience in home economics and consent of the instructor.

The influence of the newer movements in secondary education on home economics. The place of home economics in the experimental secondary school programs and in such developments as integrated and unified educational offerings, core courses, and special home economics courses from a functional point of view.

***742. Evaluation in Home Economics.** Five credit hours. Winter Quarter. General prerequisites must include Home Economics 740 and ten hours in Education or Psychology. Education 852 is recommended as a subsequent course. Miss Gilman.

A course planned for secondary school and college teachers in procedures for the appraisal of student progress in home economics. Emphasis is on checking both the acquisition of information and the attainment of other objectives of the curriculum. Experience will be provided in the construction of evaluation instruments, and also in the analysis and interpretation of data from evaluation programs in home economics.

***771. Textiles: Analysis.** Five credit hours. Winter Quarter. One one-hour class meeting and two four-hour laboratory periods each week. General prerequisites must include a course in Textiles or equivalent and twenty Quarter-credit hours of Chemistry.

The application of chemical techniques to the quantitative and qualitative analysis of textile materials, including the analysis of fiber content and non-fibrous materials which may be present in textiles.

***799. Home Economics Workshop.** Four credit hours. General prerequisites must include bachelor's degree in Home Economics or consent of the instructor. Intensive three-week sessions on selected phases of Home Economics are scheduled at irregular intervals.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

804. Seminar in Home Economics. One to six credit hours in units of one to three hours, for one Quarter or more. Autumn, Winter, Spring. General prerequisites must include graduate standing in Home Economics and consent of the instructor.

The following seminars are available:

- a. Foods and Nutrition. Miss Green, Mrs. Patton, Mrs. Prudent.
- b. Home Economics Education. Miss Lehman, Miss McGinnis, Miss Scott
- c. Textiles and Clothing. Miss Gilmore, Miss Tapscott.
- d. Seminar in Institution Management. Miss Wood.
- e. Seminar in Child Development. Miss Heye, Miss McGinnis.
- f. Seminar in Household Equipment. Mrs. Weaver.
- g. Hospital Dietetic Administration and Therapeutics. Mrs. Lewis.
- h. Home Management. Miss Newark.

840. Home Economics in Higher Education. Three credit hours. Spring Quarter. General prerequisites must include Home Economics 740 or equivalent. Miss Scott.

Present status and function of home economics at the college level; approaches to problems in curriculum development; the development of criteria for effective teaching, guidance, and testing procedures in home economics instruction at college level.

* Not given in 1954-1955.

† Not given during the academic year, 1954-1955.

898. Interdepartmental Seminar in Nutrition and Food Technology. One credit hour. Spring Quarter. In cooperation between the Institute of Nutrition and Food Technology and those instructional departments who are interested, a seminar will be conducted in nutrition and in the related field of food technology. Subject and staff to be announced each year after the approval of the Graduate School.

950. Research in Home Economics. Autumn, Winter, and Spring Quarters. Miss Davis, Miss Gilmore, Miss Green, Miss Heye, Miss Lehman, Mrs. Lewis, Miss McGinnis, Miss Newark, Mrs. Prudent, Miss Scott, Mrs. Weaver, Miss Wood.

Investigational work bearing upon the problems of living, either in the home, the institution or under commercial conditions.

HORTICULTURE AND FORESTRY

Office, 118 Horticulture and Forestry Building

PROFESSORS HOWLETT, LAURIE (EMERITUS), H. D. BROWN, W. N. BROWN, AND CHADWICK, ASSOCIATE PROFESSORS ALBAN, HARTMAN, AND KIPLINGER, ASSISTANT PROFESSORS COMIN, GIBBS, GOULD, AND HILL

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

These prerequisites include acceptable courses in pomology, vegetable gardening, floriculture and forestry.

601. Horticultural Plant Breeding. Five credit hours. Winter Quarter. Four recitations and one two-hour laboratory period each week. Mr. W. N. Brown.

A study of the applications of the principles of heredity to the modification of plants. Methods and techniques as applied to the breeding of representative horticultural plants. Also the history, scope, and role of breeding. Prospective developments, seed production, seed testing and certification, variety maintenance, and elements of field plot technique and mathematical analysis used in breeding experiments are some of the other topics treated briefly.

609. The Management of Storages for Horticultural Crops. Three credit hours. Autumn Quarter. Two lectures and one two-hour laboratory period each week. Mr. Comin.

The course will include a study of ways and means of providing proper precooling, holding, and storage conditions for fruits, vegetables, flowers, and nursery stock. It will include a discussion of temperature, humidity, and air control methods used in various structures, as well as an insight into management and operation problems dealing with maintenance of these structures and refrigeration equipment.

621. Systematic Olericulture. Three credit hours. Autumn Quarter. Two recitations and one two-hour laboratory period each week. Mr. Alban.

Special training is given in the identification of the most important vegetable varieties. Emphasis is placed on the recognition of quality in the fresh vegetable through a knowledge of varieties and factors associated with quality. The origin and botany of the principal vegetable varieties with adequate descriptive notes are also included.

622. Commercial Vegetable Crops. Five credit hours. Spring Quarter. Four recitations and one two-hour laboratory period each week. Mr. W. N. Brown.

Devoted to the study of the history, plant characteristics, physiology, and culture of the principal vegetable crops including propagation, varieties, soil adaptation, and preparation, planting, fertilizing, cultivation, pest control, and cost of production.

624. Specialty Products, including Pickling and Fermentation. Five credit hours. Autumn Quarter. Four lectures and one two-hour laboratory period each week. Mr. H. D. Brown.

Preparation of jams and jellies, syrups, baked beans, soups, and condiments. Discussions of the role of spices, sugars, water and other ingredients used in the preparation of specialty products. Principles and methods of preparing fermented goods; practices of salting and brining. The use of bacteria and yeast in the production of foods.

Not open to students who have credit for Horticulture 528 and 630.

629. Food Products Examination. Five credit hours. Winter Quarter. Three lectures and two two-hour laboratory periods each week. Mr. Gould.

The lectures cover the food laws, food standards, and subjective and objective methods of determining the quality of processed fruits and vegetables and related food products. The laboratory work is designed to acquaint the student with quick objective quality control methods, and the determination of food constituents and foreign materials.

†631. Commercial Management and Practices with Horticultural Products. Five credit hours. Summer Quarter. One lecture and two four-hour laboratory periods each week. Mr. Gould.

An evaluation of the relationships of definite grades of raw products to the quality and yield of the processed products. Particular emphasis will be given to the quality factors in the canning, freezing, and dehydration. Field trips will be taken to acquaint students with the operation of processing plants.

650. Principles and Practices of Nursery Management. Five credit hours. Spring Quarter. Four recitations and one three-hour laboratory period each week. General prerequisites must include Horticulture 649 or 713. Mr. Chadwick.

Fundamental practices involved in the layout and management of Modern Nursery. Emphasis is placed on selection of nursery sites, soil management, fertilization, transplanting, and pruning practices, pest control, digging and storage construction and management. Trips to commercial nurseries will be required.

651. Marketing of Greenhouse and Nursery Products. Three credit hours. Spring Quarter. Three recitations each week. Mr. Kiplinger, Mr. Chadwick.

The application of marketing techniques to the sale of cut flowers, pot plants and nursery stock will be considered. Attention will be given to the preparation of crops for market, to grading, packaging, shipping and selling direct and through commission houses. Emphasis will be placed on the study of markets and the elimination of periodic gluts. Several inspection trips will be made.

683. Arboriculture. Five credit hours. Autumn Quarter. Four recitations and one three-hour laboratory period each week. General prerequisites must include Botany 605 and 606.

A course devoted to the planting and maintenance of ornamental trees and shrubs and designed for students interested in city forestry, park maintenance or commercial arboriculture. Major consideration is given to environmental factors affecting plant growth, planting, fertilization, pruning, cabling, tree surgery, equipment, diagnosis of plant troubles, and pest control.

701. Minor Investigations. Two to five credit hours. Autumn, Winter, and Spring Quarters. Offered at Columbus and at Wooster. All instructors.

This course is for students who desire to work out special problems in the fields of pomology, vegetable gardening, floriculture and ornamental horticulture, horticultural products, or forestry. Students will elect work in their desired subjects after a conference with the instructor in charge.

704. Horticultural Seminar. One credit hour. Autumn and Winter Quarters. Required of all graduate students majoring in horticulture. Offered at Columbus and at Wooster. All instructors.

705. Seminar in the Historical Literature of Horticulture. Three credit hours. Autumn Quarter. Open to students in other departments upon permission of the instructor. Mr. Howlett.

A study of the history and literature of horticulture from earliest times to the present. Among the subjects covered are early gardening literature, Seventeenth and Eighteenth Century literature concerned with horticulture, as well as the history of horticulture in America. Trends and events of horticulture during the last half century are included.

Not open to students who have credit for Horticulture 605.

710. Advanced Theories and Techniques Employed in Processing Horticultural Products. Two credit hours. Autumn, Winter, and Spring Quarters. Mr. H. D. Brown, Mr. Gould.

Topics to be considered:

Autumn Quarter: Advances in quality control, plant sanitation, and plant equipment design. Mr. Gould.

† Not given during the academic year, 1954-1955.

Winter Quarter: Advanced canning, freezing, and dehydration methods. Mr. H. D. Brown.
 Spring Quarter: Advanced theory of fermented and specialty products manufacture. Mr. H. D. Brown.

711. Experimental Horticulture. Three credit hours. Autumn Quarter. Two discussion periods and four hours laboratory each week of which two hours are scheduled. General prerequisites must include five hours of general chemistry. Botany 605 or the equivalent must be included in the prerequisites or taken concurrently. This course is designed for those specializing in pomology, vegetable crops, floriculture and ornamental horticulture, although it is open to students in other departments. Mr. Howlett.

The course includes effect of environmental factors upon growth, flowering, and fruiting of horticultural plants. Nitrogen, phosphorus, potassium, magnesium, and carbohydrate deficiencies are considered, with tissue testing as one determining method. Attention is also given the effect of natural and synthetic hormones upon flowering and fruiting.

Not open to students who have credit for Horticulture 602.

712. Experimental Horticulture. Three credit hours. Winter Quarter. Two lectures and four hours laboratory each week of which two hours are scheduled. Botany 605 must be included in the general prerequisites or taken concurrently. Mr. Hill.

The course is primarily concerned with the effects of excesses and deficiencies of micro-nutrient elements upon the growth, flowering, and fruiting of horticultural plants. Also considered are means of detecting and correcting excesses and deficiencies of these plant nutrients and the relationship of the micronutrients to other essential elements.

Not open to students who have credit for Horticulture 603.

713. Advanced Plant Propagation. Five credit hours. Winter Quarter. Four recitations and one two-hour laboratory each week. General prerequisites must include a course in Ornamental Plants, and Botany 605. Mr. Chadwick.

An anatomical and physiological study of the basic principles of plant propagation. Major consideration will be given to propagation by means of cuttings, grafting, budding and seeds. Anatomical structures and the physiological responses involved in propagation by cuttings, grafts, buds, and seeds are interpreted in light of commercial practices.

Not open to students who have credit for Horticulture 649.

714. Structure of Vegetative Parts of Horticultural Plants. Three credit hours. Winter Quarter. One recitation and two two-hour laboratory periods each week. General prerequisites must include Botany 606 or equivalent, and permission of the instructor. Mr. Hartman.

A critical study is made of the effect of the various environmental factors upon the anatomical characteristics of the vegetative parts of the various horticultural crops. The influence of these environmental factors upon the anatomy and its consequent relationship to the quality of the horticultural product is emphasized.

Not open to students who have credit for Horticulture 652.

715. Structure and Development of Economic Fruits. Three credit hours. Winter Quarter. One recitation and two two-hour laboratory periods each week. General prerequisites must include twenty Quarter hours credit in Agronomy, Botany, or Horticulture. Mr. Hill.

The course is concerned with flower and fruit structure, and the different phases of fruit development of representative horticultural plants. Special emphasis is placed upon those tissues that compose the fruit and the influence of environmental and cultural factors upon fruit development and structure.

Not open to students who have credit for Horticulture 653.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 81.

898. Interdepartmental Seminar in Nutrition and Food Technology. One credit hour. Spring Quarter. In cooperation between the Institute of Nutrition and Food Technology and the several departments interested, a seminar will be conducted in nutrition and in the related field of food technology. Subject and staff will be announced each year after approval by the Graduate School.

950. Research in Horticulture and Forestry. Autumn, Winter, and Spring Quarters. Graduate students may do investigational work in some phase of the following subjects: pomology, vegetable gardening, plant breeding, floriculture and ornamental horticulture, horticultural products, and forestry. Offered at Columbus and at Wooster. Mr. Howlett, Mr. H. D. Brown, Mr. Chadwick, Mr. Alban, Mr. Diller, Mr. Kiplinger, Mr. Comin, Mr. Gibbs, Mr. Gould, Mr. Hartman, Mr. Hill, Mr. W. N. Brown.

HYDROBIOLOGY

The Franz Theodore Stone Institute of Hydrobiology
Put-in-Bay, Ohio

PROFESSOR LANGLOIS AND STAFF

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

***615. Climatology.** Four credit hours. First term. General prerequisites must include fifteen hours of biology, including one of the following courses: a course in general botany, geography, soils or descriptive meteorology.

Elements of climate and their distribution. The controls of climate. Types of climate and their distribution with particular reference to agricultural production, natural vegetation and the major soil groups. Concluded by a consideration of the recent thought on the subject of climatic regions and their boundaries.

Not opens to students who have credit for Geography 615.

†621. Invertebrate Zoology. Four credit hours. First term. General prerequisites must include twenty hours of biological science including elementary courses in zoology.

Field and laboratory. The collection and identification of invertebrate animals, with the history of the development of methods of classification of invertebrates and emphasis upon the use of keys in identification.

Not open to students who have credit for Zoology 621.

***622. Advanced Invertebrates.** Four credit hours. Second term. General prerequisites must include Zoology 621.

Field and laboratory. The study of the ecological relationships of invertebrate animals, with emphasis on fluctuations in abundance and food chains.

Not open to students who have credit for Zoology 622.

†623. Fish Ecology and Management. Four credit hours. Second term. General prerequisites must include Zoology 624 or equivalent and consent of the instructor. Mr. Langlois.

Lectures, field, and laboratory. Studies of the life histories and interspecific relationships of fishes, and of the various factors influencing their abundance.

Not open to students who have credit for Zoology 623.

†624. Fish Taxonomy and Distributions. Four credit hours. First term. General prerequisites must include elementary courses in zoology or equivalent, one additional year of biology, and consent of the instructor. Mr. Langlois.

Field and laboratory study of the distribution and classification of fishes, with emphasis on the use of phylogenetic and artificial characters of taxonomic importance. Methods of making collections and properly preserving them for study are taught.

Not open to students who have credit for Zoology 624.

†631. Animal Parasitology. Four credit hours. Second term. General prerequisites must include elementary courses in zoology or equivalent. Mr. Dickerman.

This course deals with the animal parasites, with special emphasis on the forms infesting the vertebrates of fresh water. Lectures, student reports, field and laboratory work, including methods of examination of hosts, techniques for fixing, staining, and mounting specimens.

Not open to students who have credit for Zoology 631.

* Not given in 1954-1955.

† Not given during the academic year, 1954-1955.

†650. **Limnology.** Four credit hours. First term. General prerequisites must include elementary courses in zoology or equivalent, fifteen hours in biology, ten Quarter hours in chemistry and ten Quarter hours in physics. Mr. Britt.

Field and laboratory, studies of the physical, chemical and biological factors which determine biological productivity in Lake Erie and certain waters along the south shore of the lake. Field studies include plane-table mapping, the determination of dissolved gases and hydrogen-ion concentrations, depth of light penetration, as well as quantities of plankton and bottom fauna.

Not open to students who have credit for Zoology 650.

*655. **Advanced Ornithology.** Four credit hours. First term. Lectures, field trips, laboratory work and assigned readings. General prerequisites must include a course in ornithology or its equivalent.

An advanced course dealing with the fundamental aspects of behavior of the individual bird and of bird populations under natural conditions. Topics of study include the role of instinct in the life of birds, the breeding cycle, social relations, territory, ecology and characteristics of populations. The field will consist of practice in modern techniques of field study.

Not open to students who have credit for Zoology 655.

†656. **Herpetology.** Four credit hours. Second term. Lectures, field trips, laboratory work and assigned readings. General prerequisites must include elementary courses in zoology or equivalent. Previous work in vertebrate zoology or comparative anatomy is desirable. Mr. Britt.

This course is designed to acquaint the students with local species of reptiles and amphibians, their habits, life histories, and ecology. Attention will be given also to principles of taxonomy and classification as illustrated by these groups.

Not open to students who have credit for Zoology 656.

†659. **Physiology of Aquatic Invertebrate Animals.** Four credit hours. First term. General prerequisites must include elementary courses in zoology or equivalent, chemistry through organic chemistry, fifteen hours of physics, and fundamental courses in physiology. Mr. Spoor.

Seminar, current literature, and laboratory experiments on the physiology of representative fresh-water invertebrates, with particular reference to the conditions imposed by the aquatic environment and to the mechanisms of adjustment.

Not open to students who have credit for Zoology 659.

†660. **Physiology of Fishes.** Four credit hours. Second term. General prerequisites must include Zoology 659 or equivalent and consent of the instructor. Mr. Spoor.

A special course intended for those who wish to have a detailed knowledge of the activities of fishes. The nutritive, circulatory, respiratory, sensory, and locomotor mechanisms will be considered, both from the standpoint of structure and function, and in relation to the special problems which are encountered in fishes. As far as possible the laboratory will be conducted to suit the interest of the individual student.

Not open to students who have credit for Zoology 660.

*663. **Plant Taxonomy.** Four credit hours. First term. General prerequisites must include five Quarters of biological work, including ten hours of general botany and the consent of the instructor.

Assigned readings and class discussions directed toward an understanding of phylogenetic taxonomy in all its aspects: historical, descriptive, and experimental. Recognition of various life forms in the field and the practice of herbarium techniques are incidental, but important features of the course. Students acquire facility in the use of keys and standard manuals of botany. Nearly eight hundred species of vascular plants are included in the known flora of the Erie Islands.

Not open to students who have credit for Botany 663.

*664. **Field Methods in Plant Ecology.** Four credit hours. Second term. General prerequisites must include five Quarters of biological work, including ten hours of general botany, a basic fundamental course in ecology, and the consent of the instructor.

* Not given in 1954-1955.

† Not given during the academic year, 1954-1955.

Plant communities in the glaciated limestone soils area of northwestern Ohio adjacent islands of Ontario are studied by means of quadrats, transects, and similar sampling methods. Factors of the environment are likewise analyzed by means of instruments which demonstrate differences in micro-climates and soils. Fresh-water ponds, marshes, gravel bars, dolomite cliffs, abandoned quarries, marl ponds, sand beaches, and low dunes provide pioneer habitats and illustrate various degrees of stability. Nearby estuaries furnish excellent opportunities to observe retrograde successions.

Not open to students who have credit for Botany 664.

†665. **Fresh-Water Algae.** Four credit hours. First term. General prerequisites must include six Quarters of biological work, including a course in general botany and the consent of the instructor.

The course includes lecture, library, field, and laboratory work on the fresh-water algae of the region, with particular emphasis on the phytoplankton. The aim of the course is to familiarize the student with the common forms of algae, experience in the use and making of keys, methods of collecting and preserving algae, and acquaintance with literature necessary to an appreciation of these plants.

Not open to students who have credit for Botany 665.

†667. **Physiology of Aquatic Plants.** Four credit hours. Second term. General prerequisites must include Botany 669, or a course in plant physiology, or a course in general physiology. Mr. Verduin.

Qualified students may elect to work on one or more phases of the physiology of aquatic species. The work will be largely on an experimental basis. Representative topics include measurements of photosynthesis and respiration, mineral salt nutrition, propagation of aquatic species, effects of various factors on growth and development, and the mechanism of the absorption of solutes.

Not open to students who have credit for Botany 667.

†669. **Higher Aquatic Plants.** Four credit hours. First term. General prerequisites must include five Quarters of biological work, including a course in general botany. Mr. Verduin.

The biology of the aquatic plants of the Lake Erie region other than the algae. Field work on the identification and ecology of the more important species. Laboratory and field experiments on physiological processes as exemplified in aquatics. Also lectures, discussions, and collateral readings.

Not open to students who have credit for Botany 669.

*670. **Advanced Entomology.** Four credit hours. First term. General prerequisites must include a course in general entomology or equivalent.

This course is recommended to students who desire to prepare for professional work in entomology, to those who wish to study some special group of insects, and to those students of biology who wish to know the insect groups and their modes of life. Collecting, identification and field work are stressed. Field trips are made to various islands and the mainland.

Not open to students who have credit for Entomology 670.

*671. **Aquatic Entomology.** Four credit hours. Second term. General prerequisites must include Entomology 670 or equivalent.

This course deals with aquatic insects and is for students who desire preparation for work in teaching biology and for research on aquatic resources. Taxonomy and study of larvae are dealt with principally.

Not open to students who have credit for Entomology 671.

701. **Special Problems in Hydrobiology.** Three to fifteen credit hours. All Quarters.

a. **Botany.** General prerequisites must include elementary courses in botany and one additional year of some biological subject, and the permission of the instructor in charge. Mr. Verduin.

Properly qualified students may select problems in taxonomy, ecology, or physiology of aquatic plants.

b. **Entomology.** General prerequisites must include elementary courses in zoology and courses in entomology or equivalent and the consent of the instructor in charge. Mr. Britt.

* Not given in 1954-1955.

† Not given during the academic year, 1954-1955.

Entomological subjects concerned with biological taxonomic, faunistic, morphological or economic problems may be selected.

c. Zoology. General prerequisites must include elementary courses in zoology and Zoology 625-626 or equivalent and consent of the instructor in charge. Mr. Langlois.

Subject for investigation may be selected from one of the following: limnology, ichthyology, life history, development, morphology, taxonomy, or some other phase of zoology.

GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

820. Seminar. One credit hour. Required of all students who are candidates for advanced degrees at the Stone Institute. Open to others with the consent of the instructor.

This seminar is designed to enable students to discover types of research, the regions where such studies have been conducted, and the centers of research. It provides opportunity for students at the Stone Institute to develop interests in this phase of Hydrobiology and to participate in discussions of the studies under way at the Institute.

a. Botany. Research in aquatic plants. Autumn Quarter. Mr. Verduin.

b. Zoology. Research in aquatic animals. Winter Quarter. Mr. Langlois.

c. Physical Limnology. Research in physical limnology. Spring Quarter. Mr. Britt.

†d. Literature. Summer Quarter. Mr. Verduin.

950. Research in Hydrobiology. All Quarters. Mr. Langlois, Mr. Verduin, Mr. Spoor, and Mr. Taft.

Properly qualified graduate students who so desire may enter upon some floral, faunal, ecological, or other problem under the direction of the instructor in charge of the subject chosen.

See bulletin of The Franz Theodore Stone Institute of Hydrobiology for further information.

INDUSTRIAL ARTS EDUCATION

(See Education)

INDUSTRIAL ENGINEERING

Office, 125 Industrial Engineering Building

PROFESSORS LEHOCZKY AND EDMONDSON, ASSOCIATE PROFESSOR WILLIAMS,
ASSISTANT PROFESSORS MITTEN AND RICHMAN, MR. HOLDER

Prerequisites for Graduate Work. Graduate students other than those pursuing graduate work under the five-year combination curriculum must fulfill one of the following requirements:

(a) They must be graduates of a curriculum in Industrial Engineering (Engineering Administration, Management Engineering, etc.) Students who can meet this prerequisite will normally be able to complete the work for the M.Sc. degree in three Quarters of residence.

(b) Or, they must be graduates of a curriculum in Mechanical Engineering: (Industrial or Management Options) which is fully accredited by the Engineers' Council for Professional Development. Students who fall into this category can normally complete their course requirements for the M.Sc. degree in four Quarters of residence.

(c) Or, they must be graduates of an engineering curriculum other than defined in (a) and (b), accredited by the Engineers' Council for Professional Development. Students in this category will require from five to six Quarters of residence to complete the requirements for the M.Sc. degree.

(d) There may be special cases which do not fall into categories (a), (b), or (c), but as a general rule none will be admitted unless they have the equivalent of the basic requirements of the Ohio State University curriculum in Industrial Engineering in the fields of Mathematics, Physics, Chemistry, Engineering Drawing, and Mechanics. The time requirement to complete the work for the M.Sc. degree in these cases will vary with individuals depending upon their background and the nature and quality of courses they have completed. This in addition to whatever basic requirements may be set up by the Entrance Board for admission to the School.

Areas of Study. The Department offers six major areas of study within the field of Industrial Engineering. These are: Methods Engineering, Personnel, Production Engineering, Engineering Costs, Safety Engineering, and Foundry Technology.

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

† Not given during the academic year, 1954-1955.

606. Foundry Molding Methods. Three credit hours. Winter Quarter. Three lectures. General prerequisites must include a course in Foundry Practice and courses which represent the equivalent of third year standing in the College of Engineering and must include Mathematics, Physics and Chemistry. Mr. Williams.

A study of the fundamentals of making foundry molds by machine and hand methods. Included in this course will be a study of gating and risering.

Not open for graduate credit for Industrial Engineering majors.

633. Motion and Time Study. Three credit hours. One Quarter. Winter and Spring. Two recitations and one two-hour laboratory each week. General prerequisites must include Business Organization 680. Required for majors in Industrial Management and Personnel. Mr. Holder.

The objectives, scope, and techniques of methods analysis are considered from the standpoint of the factory and office supervisor. Case problems and laboratory exercises are designed to provide students with rudimentary skill in its application of technique. Contemporary time study practices are surveyed and evaluated. Laboratory exercises are designed to demonstrate basic problems and increase student understanding, but not to provide sufficient training for actual application of techniques.

Open only to students majoring in Business Organization. Not open to those who have credit for any one of the following courses: Industrial Engineering 663, 664, or 714.

661. Production Control Charts. Three credit hours. One Quarter. Autumn and Spring. Two recitations and one two-hour laboratory period each week. Mr. Richman.

The application of charts and graphs to production problems, organization, management, operation, labor and cost control. Laboratory exercises designed to supplement the theory.

Not open for graduate credit to Industrial Engineering majors.

663. Methods Analysis. Five credit hours. One Quarter. Autumn and Winter. Two hours of lecture and six hours of laboratory each week. General prerequisites must include a course of statistical Mathematics and Industrial Engineering 661.

Principles, applications, and purposes of Methods Analysis techniques. Process and Operation analysis. Micromotion study. Principles of Motion Economy. Organization and planning of methods improvement programs. Laboratory work provides demonstration of principles and provides an opportunity for their application in a variety of representative problems.

Not open to students who have credit for Industrial Engineering 603, 604, or 714.

Not open for graduate credit to Industrial Engineering majors.

664. Work Measurements and Standards. Five credit hours. One Quarter. Winter and Spring. Three hours of lecture and four hours of laboratory each week. General prerequisites must include a course in advanced machine work and Industrial Engineering 663.

Principles, applications and purposes of Work Measurement and Standards. Characteristics and limitations of the more important techniques are discussed in detail, including Time Study and Fundamental Time methods. Methods for determination of allowances. Formula synthesis. Work measurement and job evaluation. Standards for Incentive Systems. Laboratory work provides an opportunity for student experience in the use of specific techniques and study of their characteristics.

Not open to students who have credit for Industrial Engineering 603, 604, or 714.

Not open for graduate credit to Industrial Engineering majors.

706. Industrial Quality Control. Three credit hours. One Quarter. Autumn and Winter. Three lectures and recitations each week. General prerequisites must include a course in Statistical Methods and Industrial Engineering 661 and 662. Mr. Mitten.

A study of industrial standards, their control and application. Simplification, inspection, waste elimination and allied subjects. Statistical quality control applications.

708. Plant Equipment and Design. Five credit hours. One Quarter. Autumn, Winter, Spring. General prerequisites must include Industrial Engineering 603 or 663 and 664 and 707. Mr. Richman.

A study, both from the technical and the economic points of view, of equipment used in manufacturing plants. Included are small tools, machine tools, mass production equipment, quality control equipment, materials handling and general and special purpose equipment. A study of the general problem of plant design, including structure, space utilization, layout and floor, and related topics such as power requirements and distribution, heat, light, ventilation, transportation and so forth. Design of a plant for the processing of a specified product.

709. Production Engineering. Five credit hours. One Quarter. Winter and Spring. General prerequisites must include Industrial Engineering 663, 664, 707. Mr. Edmondson.

Production engineering involves the integration and correlation of the several areas of Industrial Engineering activity in terms of a product. Included are production design, equipment planning, tool design, production and its control, quality control, cost reduction, standardization, process development, product development and others.

714. Time and Motion Study. Three credit hours. One Quarter. Autumn and Spring. Three recitations and six hours of preparation each week.

Principles, aims, methods and applications of time and motion study including job analysis, job standardization, formula construction, job evaluation and wage evaluation.

Not open to students majoring in Industrial Engineering.

Not open to students who have credit for Industrial Engineering 603, 604 or 663 or 664.

715. Principles of Industrial Engineering. Three credit hours. Autumn Quarter. Three recitations each week. General prerequisites must include two or more shop courses or their equivalent in industrial experience. Mr. Holder.

A general survey of the industrial engineering phases of a manufacturing establishment with emphasis upon the relationship of the several phases to other engineering activities. Included are the development of engineering organizations, the management of men, materials, machines and equipment, time and motion study, job and wage evaluation, standardization, waste elimination, and so forth.

Not open to students majoring in Industrial Engineering.

Not open to students who have credit for Industrial Engineering 602 or Business Organization 680.

716. Foundry Casting Control. Three credit hours. Spring Quarter. Three lectures. General prerequisites must include Industrial Engineering 606 and 663. Mr. Williams.

This course correlates the material of Industrial Engineering 606 and the courses in foundry materials with respect to casting difficulties.

717. Foundry Casting Methods. Three credit hours. Autumn Quarter. Three lectures. General prerequisites must include Industrial Engineering 606. Mr. Williams.

A description and analytical study of investment, die, centrifugal, permanent mold, vacuum and slush casting methods.

718. Foundry Heat Treating of Castings. Three credit hours. Winter Quarter. Two lectures and one two-hour laboratory. General prerequisites must include Industrial Engineering 606 or its equivalent and Metallurgy 755. Mr. Williams.

An analytical study of heat treating of castings as such principles apply to castings.

719. Foundry Melting Methods. Three credit hours. Spring Quarter. Three lectures. General prerequisites must include Industrial Engineering 706 and 716, Metallurgy 755. Mr. Williams.

An analytical study of foundry melting methods for the production of castings.

720. Work Simplification. Three credit hours. Winter Quarter. Two lectures and two laboratory hours each week. Open only to Seniors and Graduate students majoring in Home Economics.

The application of basic Motion and Time Study principles to the field of Home Economics. Product analysis, process and operation charts, micromotion study principles and techniques. Basic principles of Motion Economy and their application. Basic principles of time study, of standards and related matters.

761. Engineering Economy. Three credit hours. One Quarter. Autumn and Spring. Three lectures and recitations each week. General prerequisites must include a course in calculus, Accounting 624, and Industrial Engineering 661 or Welding Engineering 641. Mr. Mitten.

Quantitative analysis from the standpoint of cost control of machines, equipment, and labor.

762. Production Control. Three credit hours. One Quarter. Winter and Spring. Three lectures and recitations each week. General prerequisites must include Industrial Engineering 761. Mr. Mitten.

The application of quantitative methods of control in industry in the fields of inverse relationships, least cost combinations, purchasing quantities, seasonal production and related problems.

771. Safety Engineering. Three credit hours. One Quarter. Autumn, Winter, Spring. Three lectures each week. General prerequisites must include a course in elementary machine work and six hours additional credits in other laboratory courses involving mechanical equipment. Mr. Lehoczky.

The nature, causes, and costs of industrial accidents and occupational diseases. Methods of accident prevention, physical, supervisory, and education. Ohio laws, regulations, and aids.

798. Advanced Studies in Industrial Engineering. Three to twenty-four credit hours. All Quarters. General prerequisites must include written permission of the instructor.

The student must register for specific classes in areas as indicated below, and may register for more than one at a time. However, he cannot accumulate more than twenty-four credit hours for the entire course.

- (a) Job Evaluation.
- (b) Organized Labor and Industrial Engineering Methodology.
- (c) Industrial Applications of Statistics.
- (d) Quality Control.
- (e) Engineering Economy.
- (f) Production Planning and Control.
- (g) Contemporary Problems in Plant Layout and Design.
- (h) Materials Handling.
- (i) Time Standards and Estimates.
- (k) Foundry Technology
- (l) Production Engineering.

799. Special Problems in Industrial Engineering. Three to fifteen credit hours. Autumn, Winter, and Spring Quarters. Written permission of the instructor is required.

This course is intended to give the advanced student an opportunity to pursue special studies not offered in fixed curricula, in areas related to courses such as Industrial Engineering 663, 664, 706, 708, 709, 761, 762, and 771.

Not more than six credit hours may be accumulated in any one area of specialization.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

801-802-803. Seminar in Industrial Engineering. Two credit hours. Autumn, Winter, and Spring Quarters. Required of all graduate students majoring in Industrial Engineering. Mr. Lehoczky.

805. Foundry Research. Three to twelve credit hours. Autumn, Winter, and Spring Quarters. General prerequisites must include fundamental courses in the area to be explored. Mr. Williams.

Advanced work in one or more of the following: foundry-melting practices, molding techniques, heat treating of castings, laboratory test procedures, and materials for molding and foundry use.

811. Methods Engineering. Three to twelve credit hours. Autumn, Winter, and Spring Quarters. General prerequisites must include Industrial Engineering 663 and 664. Mr. Lehoczky.

Advanced work in one or more special phases of time study, motion study, job evaluation, wage analysis and payment systems, speed and effort rating. Analysis of work set-ups, of production lines and related matters. Design and redesign. The viewpoint of unions and problems arising from labor-management relationships.

821. Problems in Production Engineering. Three to twelve credit hours. Autumn, Winter, and Spring Quarters. General prerequisites must include Industrial Engineering 709. Mr. Edmondson.

Advanced work in one or more phases of production engineering involving problems in production design, equipment planning, tool design, quantity and quality control, cost reduction, development, and so forth.

828. Advanced Studies in Plant Design and Materials Handling. Three to twelve credit hours. One Quarter. Autumn, Winter, Spring. General prerequisites must include Industrial Engineering 708. Mr. Richman.

Advanced work in one or more special phases of plant design and materials handling.

851. Personnel Research in Engineering Industries. Three to twelve credit hours. Autumn, Winter, and Spring Quarters. General prerequisites must include Industrial Engineering 602 and 664, and Business Organization 690. Mr. Lehoczky.

Advanced work on a graduate level in one of the several phases of personnel management in engineering industries. An integral part of the program which is established under the leadership of the Personnel Research Board.

861. Production Control Research. Three to twelve credit hours. Autumn, Winter, and Spring Quarters. General prerequisites must include Industrial Engineering 761, and Industrial Engineering 762. Mr. Mitten.

Advanced work in the several phases of production control (see Industrial Engineering 761 and 762) including the design of a manufacturing enterprise, the organizational set-up of engineering establishments and similar problems.

866. Research in Statistical Quality Control. Three to twelve credit hours. Autumn, Winter, and Spring Quarters. General prerequisites must include Industrial Engineering 706 and 761. Mr. Mitten.

Advanced work in the several phases of statistical quality control (see Industrial Engineering 706), consists primarily of the application of statistical theory to problems of the control of quality.

871. Safety Engineering Research. Three to twelve credit hours. Autumn, Winter, and Spring Quarters. General prerequisites must include Industrial Engineering 771. Mr. Lehoczky.

Advanced work in one or more phases of safety engineering: plant design, equipment design, accident prevention programs and others. The course is designed to be an integral part of a general program in safety engineering and cannot be taken alone.

899. Interdepartmental Seminar. One to five credit hours. All Quarters. When two or more departments desire to establish an interdepartmental seminar on a subject of common interest the chairmen or authorized representatives of the departments concerned shall prepare a course description including the names of faculty members designated to conduct the seminar. The statement shall be submitted to the Executive Committee of the Graduate School for prior approval.

950. Research in Industrial Engineering. Autumn, Winter, and Spring Quarters. Mr. Lehoczky and others.

Research work in several phases of Industrial Engineering on the advanced level.

Open only to advanced graduate students who are majoring in Industrial Engineering.

INTERDEPARTMENTAL SEMINAR

An interdepartmental seminar may be established by two or more departments, on a subject of common interest. The chairmen or authorized representatives of the interested departments prepare a description of the course, including the names of the faculty members who will conduct the seminar, and present this description to the Executive Committee of the Graduate School for its approval. Such a seminar, if approved, is found in the offerings of the participating departments under the number 899.

INTERNATIONAL STUDIES

Office, 100 University Hall

SUPERVISORY COMMITTEE

PROFESSORS JAMES AND GRIFFIN, ASSOCIATE PROFESSORS NEMZER, SEIDLIN, FISHER, AND BENNETT

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

601. Minor Problems in International Studies. Three credit hours. Winter Quarter. Two class meetings each week. Open to students majoring in International Studies or having equivalent preparation. General prerequisites must include Political Science 613 or its equivalent. A reading and research program, in addition to panel discussions and informal conferences is worked out to meet the special interest of those enrolled and to allow full scope to the initiative of each student. Mr. Nemzer with the collaboration of other specialists in International Studies Curriculum.

721. Europe. Three credit hours. Spring Quarter. Two one-hour class meetings each week, and a periodic conference arranged for each student. General prerequisites must include senior standing in International Studies Curriculum. Mr. Peattie with the collaboration of other specialists in International Studies Curriculum.

A proseminar on selected regions in Europe. Students will study the political, economic, social and cultural institutions of a particular region, such as the Balkans, Germany, France, Scandinavia, etc.

731. Latin America. Three credit hours. Spring Quarter. Two one-hour class meetings each week, and a periodic conference arranged for each student. General prerequisites must include senior standing in International Studies Curriculum. Mr. Carlson with the collaboration of other specialists in International Studies Curriculum.

A proseminar on selected regions in Latin America. Students will study the political, economic, social and cultural institutions of a particular region, such as Argentina, Central America, Amazon Basin, etc.

741. The Orient. Three credit hours. Spring Quarter. Two one-hour class meetings each week, and a periodic conference arranged for each student. General prerequisites must include senior standing in International Studies Curriculum. Mr. Hoffman, with the collaboration of the other specialists in International Studies Curriculum.

A proseminar in selected regions in the Orient. Students will study the political, economic, social and cultural institutions of a particular region, such as India, Pakistan, Japan, China, Manchuria, Malaya, Burma, etc.

ITALIAN

(See Romance Languages and Literature)

JOURNALISM

Office, 203 Journalism Building

PROFESSOR POLLARD, ASSOCIATE PROFESSORS GETZLOE, WAGNER AND MAGUIRE

Courses of study leading to the Master's degree may be undertaken as a continuation of either the editorial or management curriculum in the School of Journalism. A major in journalism for the Master's degree does not necessarily mean that all forty-five hours required for the degree shall be in journalism. Related courses in the social sciences, advertising, or English may be scheduled in an integrated program worked out by the student and his adviser. Thus, for example, a journalism-advertising, journalism-history, journalism-political science, or journalism-sociology integrated course of study may be arranged, according to the area of interest of the individual student.

Requirements for the Master's degree with a major in journalism include an undergraduate background of a satisfactory number of basic courses in journalism, two journalism seminars preceding the thesis (research) course, and an approved thesis. In addition, each student is required to take either History 812, Introduction to Historical Research, or Political Science 631, Methods of Governmental Research, as a practice course in research, or satisfy his adviser that he is competent to handle a research problem.

Students who plan a minor in journalism in connection with a major in another field must have the written approval of the Director of the School of Journalism.

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

***601. News Editing.** Three credit hours. Spring Quarter. Two recitations and one two-hour laboratory period each week. General prerequisites must include a course in copyreading. Permission of instructor necessary.

Study of and practice in the evaluation of news, especially that furnished by press associations. Study of contemporary telegraph and cable news in the daily press, with a comparison of the editing and news evaluation of different newspapers, including rewrite.

602. Magazine Writing. Four credit hours. One Quarter. Autumn and Spring. Three lecture and recitation periods and one laboratory period each week. Permission of the instructor is necessary. Mr. Getzloe.

Instruction in and writing of articles for magazines of general circulation and for trade, class and technical journals. Problems of magazine management, editing and production.

603. The Writing of Reviews and Criticisms. Three credit hours. Winter Quarter. General prerequisites must include elementary courses in journalism or permission of the instructor must be obtained. Mr. Maguire.

Study of the work of the motion picture, literary, music, and art critic, particularly on newspapers, practice in writing reviews and criticism.

605. Writing and Editing Radio and Television News. Three credit hours. One Quarter. Autumn and Winter. Two recitations and one laboratory period each week. General prerequisites must include elementary courses in journalism or permission of the instructor. Mr. Wagner.

The study of the problems of preparing and presenting news material for the radio and television. Emphasis on the gathering, selection, and editing of news material for radio broadcasting. Practice in the processing of press association reports for newscasts.

606. Advanced Radio and Television News Writing and Editing. Two credit hours. One Quarter. Autumn, Winter, Spring. Three laboratory periods each week. General prerequisites must include Journalism 605. Mr. Wagner.

Continuation of Journalism 605, with emphasis on editing and newscasting through laboratory experience in the news room of WOSU.

607. Special Radio and Television News Problems. Three credit hours. Spring Quarter. Two class meetings and one laboratory period each week. General prerequisites must include Journalism 605 and 606, or Journalism 605 and permission of the instructor. Mr. Wagner.

A study of the special types of radio and television news programs—the documentary, special events, sports, commentary, interview. Practice in planning, writing, and producing these programs.

* Not given in 1954-1955.

612. Advanced Magazine Writing and Editing. Four credit hours. Spring Quarter. General prerequisites must include Journalism 602. Mr. Getzloe.

A continuation of Journalism 602 with emphasis on the work of magazine editing, management, and production.

614. Law of the Press, Radio, and Television. Five credit hours. One Quarter. Autumn and Winter. Five recitations each week. General prerequisites must include elementary courses in journalism. Mr. Pollard.

Origin and development of freedom of expression, history, principles, and provisions of the laws of libel and slander, copyright and other statutes affecting newspapers, other publications, and radio.

617. Public Relations. Three credit hours. Autumn Quarter. Three class meetings each week. Permission of the instructor necessary. Mr. Maguire.

Study of public relations problems, policies, and practices of welfare and professional organizations, educational and other institutions, industry, commerce and government agencies. A study of the manner in which these organizations make their activities known and how they can most effectively use the media of publicity, the press especially. Organizing of publicity projects and campaigns and their effect on public opinion and action.

618. Techniques of Public Opinion Analysis. Three credit hours. Winter Quarter. Three class meetings each week. General prerequisites must include Journalism 617 and permission of the instructor. Mr. Wagner.

A study of methods used by government and industry, with emphasis on the use of the press and other agencies of mass communication. Techniques and problems of content analysis, readership and listenership studies, public opinion polling. Work on projects in opinion measurement.

619. Public Relations Publications. Three credit hours. Spring Quarter. Two class meetings and one laboratory period each week. General prerequisites must include Journalism 617, and, for non-journalism majors, permission of the instructor is also required. Mr. Maguire.

A study of the functions and problems of producing organizational publications serving public purposes. Instruction and practice in procuring and evaluating copy and pictures.

621. The Editorial Page. Three credit hours. One Quarter. Autumn and Spring. Three recitations each week. Mr. Getzloe, Mr. Pollard.

Study of the purpose, form, style, and spirit of the editorial. Consideration of current events, practice in news interpretation and other editorial writing, and study of editorial pages.

622. Mass Media and Contemporary Affairs. Three credit hours. One Quarter. Autumn and Winter. Three recitations each week. Permission of instructor necessary. Mr. Wagner.

The function of newspapers, radio, television, and magazines as media of mass communication in the social system. The nature of these media as public opinion and propaganda instruments. Discussion and interpretation of current events.

623. Foreign Journalism and Radio. Three credit hours. Autumn Quarter. General prerequisites must include a course in the history of journalism in the United States and elementary courses in political science. Mr. Getzloe.

Consideration of the press and radio of other nations.

626. The Newspaper Business Office. Three credit hours. One Quarter. Autumn and Winter. Two class hours and one three to four-hour laboratory period on the *Lantern* each week. Mr. Pollard.

Consideration of the tasks and problems of the newspaper business manager, with emphasis on factors affecting newspaper circulation. Types of newspaper circulation, and their evaluation. Circulation methods and policies in use on various types of newspapers.

628. Newspaper Advertising and Promotion. Three credit hours. One Quarter. Winter and Spring. Two class hours and one three to four-hour laboratory period on the *Lantern* each week. General prerequisites must include Journalism 626. Mr. Pollard.

Factors affecting newspaper advertising. Types of newspaper advertising, and their development. Advertising methods and policies in use on various types of newspapers, together with promotional and other service functions of the newspaper.

650. Special Problems in Journalism. Two to five credit hours. Autumn, Winter, and Spring Quarters. Assigned readings, conferences, and reports. Permission of the instructor necessary.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

802-803-804. Seminar in Journalism. Three to five credit hours. Autumn, Winter, and Spring Quarters. Mr. Pollard and staff.

Research in various fields in journalism. Integrated reading and research in the fields of (1) history of American (or Ohio) journalism, (2) the press and public opinion, (3) the press and political processes, (4) special problems in the law of the press, (5) newspaper management problems, (6) radio news problems, (7) public relations.

950. Research in Journalism. Autumn, Winter, and Spring Quarters. Mr. Pollard and staff.

This course is to be used only for the master's thesis.

LATIN LANGUAGE AND LITERATURE

(See Classical Languages and Literature)

LAW

Office, 113 Page Hall

PROFESSORS STRONG, MATHEWS, CALLAHAN, DAVIES, WILLS, AND LATTIN, ASSOCIATE PROFESSORS STANGER, BALL, AND POLLACK, ASSISTANT PROFESSORS HILL, LYNN, AND WARREN

Negotiable Instruments Law. Three credit hours. Autumn Quarter. Mr. Lynn.

Types of Commercial or Negotiable paper; transfer; purchase and payment in due course, discount and security.

Britton, Cases on Bills and Notes, 4th Edition.

Constitutional Law. Six credit hours. Three hours. Winter Quarter; three hours, Spring Quarter. Mr. Strong.

Functional study of the major substantive, methodological, and federalistic limitations upon governmental power now obtaining under the practice of judicial review. Although emphasis is placed upon federal constitutional law, attention is directed to Ohio constitutional law in those areas where the constitution of Ohio provides greater limitation than does that of the United States.

Strong, American Constitutional Law.

Contracts. Eight credit hours. Five hours, Autumn Quarter; three hours, Winter Quarter. Mr. Stanger.

Remedies available for breach of contract; offer and acceptance; consideration and promissory estoppel; third party beneficiaries; the assignment of rights and delegation of duties; conditions; impossibility and frustration; the statute of frauds. Dawson and Harvey, Cases and Materials on Contracts and Contract Remedies.

Criminal Law. Four credit hours. Autumn Quarter. Mr. Hill.

Survey of the criminal law as a means for attaining certain socially desirable ends, such as preservation and protection of life and property. Two major problems will be stressed throughout the course; what behavior should be made criminal, and what should be done with persons who engage in it. Social science data will be used in the resolution of legal problems. The issue of the relationship between the operation of the criminal law and the maintenance of civil liberty will also be considered.

Michael and Wechsler, Criminal Law and Its Administration.

Evidence. Six credit hours. Three hours, Autumn Quarter; three hours, Winter Quarter. Mr. Ball.

A survey of the rule of evidence and consideration of the problems of proof before judicial, administrative, and arbitral tribunals. The examination and impeachment of witnesses, competency and privilege of witnesses; direct, circumstantial and demonstrative evidence; expert testimony; authentication of documents; best evidence and parol evidence rule; the hearsay rule and its exceptions; presumption and the burden of proof; judicial notice.

McCormick's Cases on Evidence.

Income Taxation. Four credit hours. Autumn Quarter. Mr. Platt.

A study of the federal income tax; the concept of taxable gross income; deductions; methods for reporting income; capital gains and losses; treatment of corporations and shareholders, partnerships, and trusts. The course is taught by the problem method.

Surrey and Warren, *Federal Income Taxation* (2nd ed.).

Jurisprudence. Three credit hours. Mr. Pollack.

A study of jurisprudential thought as represented by the various general theories of or about law. The course aims to provide a critical and a comparative assessment of the leading juristic doctrines and of their relationship to social control policy and to the historical and contemporary development of legal precepts (judicial, legislative and administrative). Instruction is given through individual research and group discussion.

Patterson, *Jurisprudence*.

Local Government Law. Three credit hours. Mr. Warren.

Types and objectives of local governmental units; their place in the governmental structure—intergovernmental relations; legal aspects of original organization and changes; personnel; lawmaking by local bodies; community planning and development; regulation of business activity and private conduct; finance; auxiliary powers; legal responsibility of local governmental units; remedial sanctions.

Fordham, *Local Government Law*.

Private Corporations. Five credit hours. Winter Quarter. Mr. Davies.

A consideration of the business corporation as a device for the furtherance of trade and of manufacturing, with emphasis upon the law of corporate finance and upon problems of present-day importance. More specifically, the course is a study of the formation of corporations; the separate corporate capacity or entity privilege and its limitations; the criminal and tort liability of corporations; directors and management; rights and liabilities on contracts as effected by the statement of corporate purposes; rights and powers of shareholders; issue of shares and subscriptions, underwriting, marketing of securities; stock structure and classes of shares; capital requirements and declaration of dividends; redemption of shares; reduction of legal capital; liabilities and shareholders, directors, and promoters to the corporation and to creditors in connection with the issue of shares; transfer of shares (rights and liabilities of the corporation, transferor and transferee); fundamental changes in the corporate organization; minority rights; and shareholders' actions.

Stevens and Larson, *Cases on Corporation*.

Property I. Six credit hours. Three hours, Autumn Quarter; three hours, Winter Quarter. Mr. Callahan.

The incidents of ownership as applied to both real and personal property; possessory interests; concurrent interests; marital interests; future interests; contractual modification of these interests. The acquisition and transfer of ownership; adverse possession; conveyances (deeds, mortgages and leases); intestacy; wills; the recording system; title registration.

Callahan, *Materials on the Law of Property*, Book I.

Estate-Gift Taxation. Three credit hours. Mr. Glander.

A consideration of the law of Federal gift and estate taxation, and a survey of federal tax practice. Interrelationships of death and gift taxes with federal income taxes will be stressed.

Warren and Surrey, *Federal Estate and Gift Taxation*, 1952 Ed.; C. C. H. *Current Law and Practice*.

MANUAL ARTS

(See Education)

LINGUISTIC STUDIES

ADVISORY COMMITTEE: PROFESSORS SPERBER (CHAIRMAN), SCHUTZ, ABBOTT, AND UTLEY

Graduate instruction in linguistics is offered in Classics, English, German, and Romance Languages. An advisory Committee coordinates the different phases of instruction. Students are encouraged to formulate interdepartmental programs of study and research and to provide a broad and adequate foundation for scholarship. In selecting a topic for a thesis or a dissertation a student should carefully consider the specialized research interests of the instructor with whom he expects to work. The following summary of courses indicates the opportunities for graduate study in this field. A more detailed description of each of these courses will be found under the appropriate departmental announcements.

CLASSICS

Latin and Greek

627. Vulgar Latin. Mr. Abbott.
 720. Introduction to Historical Greek and Latin Grammar. Mr. Abbott.

ENGLISH

625. Standards of English Usage. Mr. Bloomfield.
 627. The Language We Speak. Mr. Bloomfield.
 701. Minor Problems in English. English Language. Mr. Utley, Mr. Estrie.
 746. Middle English Literature. Mr. Utley.
 751. Old English Poetry. Mr. Bloomfield.
 755-756. Linguistics and English. Mr. Utley.

GERMAN

656. Introduction to the Historical Study of German. Mr. Sperber, Mr. Fleischhauer.
 673. Elementary Middle High German. Mr. Fleischhauer.
 705. Introduction to the Study of Language. Mr. Sperber.
 706. Elements of Semantics. Mr. Sperber.
 801. Advanced Middle High German. Mr. Sperber.
 805. Gothic and Old High German I. Mr. Sperber.
 810. Gothic and Old High German II. Mr. Sperber.
 870. Seminar in German Linguistics. Mr. Sperber, Mr. Fleischhauer.

ROMANCE LANGUAGES

French

628. Modern French Syntax. Mr. Meiden.
 632. French Pronunciation. Mr. Rockwood.
 801-802. Introduction to Old French. Mr. Schutz.
 803-804. Old Provençal. Mr. Schutz.
 805. Middle French Literature. Mr. Schutz.

Spanish

617. Modern Spanish Syntax. Mr. Anibal.
 620. Spanish Pronunciation and Diction. Mr. Sapon.
 805-806. Old Spanish. Mr. Schutz.

MATHEMATICS

Office, 306 University Hall

UNIVERSITY RESEARCH PROFESSOR RADO, PROFESSORS HELSEL, KUHN (EMERITUS), MORRIS (EMERITUS), HALL, MANN, REICHELDERFER, AND MICKLE, ASSOCIATE PROFESSORS ALDEN, WHITNEY, RYSER, CALDERON, AND PEPPER, ASSISTANT PROFESSORS BAREIS (EMERITUS), BEATTY (EMERITUS), CARIS (EMERITUS), RICKARD, JONES, MILLER, AND KLEINFELD

Any student desiring to work for a graduate degree in the Department of Mathematics should consult the general regulations of the Graduate School in this Bulletin. The following requirements supplement the general regulations:

Prerequisites for Graduate Work: Graduate work in mathematics presupposes satisfactory completion of the equivalent of 45 Quarter hours in college mathematics. If this requirement is not met at the time of admission, the deficiency is made up in excess of the regular requirements. It is desirable, but not required, that students should also have a background in physics, engineering, or other fields in which mathematics is used.

Requirements for the Master's degree: (a) In accordance with general requirements, 46 Quarter hours of work are required in residence. Of these 45 hours, 5 hours may be credited for the thesis; not more than 20 hours may be credited in "600" courses except in special cases. (b) A reading knowledge of French and German is desirable, but is not a fixed requirement.

Requirements for the degree of Doctor of Philosophy: (a) Initial requirements are a Master's degree in mathematics or 45 Quarter hours credit on the graduate level. When these requirements are met, a general course of study is approved by the Departmental Committee on Graduate Degrees. In addition to initial requirements mentioned above, a student should have at least 40 Quarter credit hours in the more advanced graduate courses to provide a good general background and adequate specialized knowledge as a basis for the dissertation. (b) The student should meet the language requirement as early as possible. The normal language requirement is a dictionary reading knowledge of French and German. (c) The general examination must be taken at least three Quarters before the student expects to come up for the degree. (d) When the language requirement has been met and the general examination passed, the student is eligible for admission to candidacy for the doctorate.

Graduate Mathematics Club. The membership consists of the staff and the graduate students. The meetings, held fortnightly, are devoted to the presentation of original investigations, as well as reports on mathematical literature and pedagogy. On application to the Department office, advance notices of meetings will be sent to all who may be interested.

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51. These general prerequisites include an acceptable course in calculus.

601. Advanced Calculus. Five credit hours. One Quarter. Autumn and Winter. General prerequisites must include one year of calculus.

The theory of limits, functions, continuity; definition and meaning of ordinary and partial derivatives; definition of definite integrals, proper and improper; fundamental theorem of the integral calculus; functions defined as integrals containing a parameter; mean value theorems; convergence of series; power series; implicit functions.

***605. The Mathematical Approach.** Five credit hours. Spring Quarter. Elective. General prerequisites must include junior, senior, or graduate standing with a cumulative point hour ratio of 3 or better and permission of the instructor. Mr. Hall.

This course is meant to serve as a broadening course for capable students who have no special training in mathematics. The content will be selected for the purpose of explaining some fundamental issues in mathematics and the ways in which mathematicians think about them. No specific background in mathematics is presupposed. Topics will be selected from the following areas: foundations of mathematics, number theory, group theory, algebra, analysis, statistics, geometry, topology and history of mathematics.

607. Introduction to the Theory of Functions of a Complex Variable. Five credit hours. One Quarter. Autumn and Spring. General prerequisites must include Mathematics 601.

The primary purpose of this course is to acquaint the student with fundamental facts about analytic and harmonic functions that are indispensable in applied mathematics. Topics discussed include power series expansions, the formula of Cauchy, residues, conformal mapping, elementary functions in the complex domain.

608. Advanced Engineering Mathematics I. Three credit hours. Autumn Quarter. Mr. Alden.

Ordinary differential equations and systems of equations, with applications.

609. Advanced Engineering Mathematics II. Three credit hours. Winter Quarter. Mathematics 609 may be taken without Mathematics 608. Mr. Alden.

Fourier series; boundary value problems in partial differential equations; line integrals; surface integrals; integrals containing a parameter.

610. Advanced Engineering Mathematics III. Three credit hours. Spring Quarter. General prerequisites must include Mathematics 609 or its equivalent Mr. Alden.

Vector algebra and analysis; introduction to complex variables.

611. Differential Equations. Five credit hours. Winter Quarter.

Equations of first and second orders: linear equations with constant coefficients; solutions in series; numerical approximations; the existence theorem of Picard; systems of ordinary equations; the Legendre and Bessel equations with certain applications.

613. Advanced Calculus I. Three credit hours. Wright Field only. General prerequisites must include one year of calculus.

Limits and continuity, ordinary and partial derivatives, change of variables, definite and indefinite Riemann integrals.

Not open to students who have credit for Mathematics 601.

614. Advanced Calculus II. Three credit hours. Wright Field only. General prerequisites must include Mathematics 613.

Line and surface integrals, the theorems of Green and Stokes, infinite series, power series and Fourier series, improper integrals.

Not open to students who have credit for Mathematics 601.

* Not given in 1954-1955.

615. Introduction to Complex Variables I. Three credit hours. Wright Field only. General prerequisites must include Mathematics 613 and 614 or permission of the instructor.

Algebra of complex numbers, limits and continuity, analytic and harmonic functions, special transformations, conformal mapping and applications.

Not open to students who have credit for Mathematics 607.

616. Introduction to Complex Variables II. Three credit hours. Wright Field only. General prerequisites must include Mathematics 615.

Line integrals, the Cauchy theorem with applications, power series expansions, residue theory, analytic continuation, many-valued functions.

Not open to students who have credit for Mathematics 607.

618. Differential Equations I. Three credit hours. Wright Field only. General prerequisites must include one year of calculus.

Linear equations of first order, equations of first order and first degree, linear equations of higher order.

Not open to students who have credit for Mathematics 611.

619. Differential Equations II. Three credit hours. Wright Field only. General prerequisites must include Mathematics 618.

Series solutions, and equations of Bessel and Legendre, boundary value problems, Picard's method, numerical solutions.

Not open to students who have credit for Mathematics 611.

620. Vector Analysis. Three credit hours. Wright Field only. General prerequisites must include Mathematics 613 and 614 or permission of the instructor.

Algebra of vectors, gradient, divergence, curl, Laplacian, the theorems of Green and Stokes.

Not open to students who have credit for Mathematics 661.

621. Advanced Geometry. Five credit hours. Autumn Quarter. Mr. Fisher.

This course is designed primarily for students in the College of Education. Emphasis is placed on clarity of expression and logical structure. Topics are selected from the following list: points, lines, and circles connected with a triangle, concurrency and collinearity, vector geometry, mean centers, harmonic properties, quadrilaterals, orthogonal circles, inversion, poles and polars, coaxial circles, orthogonal and conical projection, basic ideas of non-Euclidean geometry.

***623. Projective Geometry.** Five credit hours. Spring Quarter. General prerequisites must include a course in calculus.

This is a course in synthetic projective geometry which includes such topics as: axioms, duality, double ratio, projective and metric properties of conics, pole and polar, involutions, and collineations.

†625. Solid Analytical Geometry. Five credit hours. Autumn Quarter. General prerequisites must include a course in calculus. Mr. Miller.

The topics studied in this course include: elementary theory of determinants and matrices, systems of linear equations, equations of curves and surfaces, transformation of coordinates, and classification of quadric surfaces.

626. Fourier Series and Boundary Value Problems. Five credit hours. Spring Quarter. General prerequisites must include either Mathematics 608 or 611. Mr. Alden.

Expansion of functions in Fourier Series and in series of Legendre polynomials and of Bessel functions; solution of boundary value problems from mathematical physics.

Not open to students who have credit for Mathematics 721.

631. History of Mathematics. Three credit hours. Spring Quarter. Permission of the instructor necessary. Mr. Lazar.

This course is designed primarily for students interested in the origin and growth of mathematical ideas. Its purpose is to trace the development of elementary mathematics from its primitive origins to its present form. The topics studied include the development of arithmetic, algebra, geometry, trigonometry, and calculus.

* Not given in 1954-1955.

† Not given during the academic year, 1954-1955.

641. Theory of Equations. Five credit hours. Autumn Quarter. Mr. Deskins.

Properties of polynomials and roots of polynomials, number fields, selected topics from modern algebra.

651-652. Fundamental Ideas in Algebra and Geometry. Five credit hours. Winter and Spring Quarters. Mathematics 652 may be taken without Mathematics 651 if permission is obtained from the instructor. Mr. Miller, Mr. Fisher.

The aim of this course is to provide a suitable mathematical background for teachers and prospective teachers of secondary school mathematics. The content will include a discussion of rational numbers, real numbers, complex numbers, and finite fields; finite groups; theory of numbers; number scales; empirical and historical development of algebraic and geometric facts; undefined elements; types of assumption used in algebra and geometry; Euclidean geometry; and certain non-Euclidean geometries.

661. Vector Analysis. Five credit hours. Spring Quarter. General prerequisites must include Mathematics 601 and a course in physics, or the equivalent.

The algebra and calculus of vectors; applications to mechanics. Partial differential operators, transformation theorems for integrals. An introduction to the theory of the electrostatic potential.

670. Matrices and Determinants. Five credit hours. Winter Quarter. Mr. Ryser.

This course covers the fundamentals of elementary matrix theory. Particular emphasis is given to the following topics: determinants and systems of linear equations, vector spaces, rank, the characteristic polynomial, and similarity and congruence transformations.

672-673. Mathematical Statistics. Five credit hours. Winter and Spring Quarters. General prerequisites must include a course in calculus. Mr. Whitney.

Permutations, combinations. Total, compound, conditional probability. Discrete distributions. Continuous distributions. Binomial, Poisson, normal, chi-square, t , F distributions. Limit theorems of probability. Theory of testing simple hypotheses. Particular applications involving t tests, chi-square tests, F tests, non-parametric tests. Confidence intervals. Regression analysis. Analysis of variance in a four-way classification.

680. Elementary Number Theory. Five credit hours. Spring Quarter. Mr. Mann.

Congruences and Diophantine equations, continued fractions, the quadratic reciprocity law, and selected topics. This course utilizes concrete examples to introduce concepts and methods of modern algebra.

***692. Finite Differences.** Five credit hours. Autumn Quarter. Given in alternate years. Mr. Whitney.

An introduction to finite differences; development of the more important methods of interpolation and summation.

700. Minor Problems. One to five credit hours. Autumn, Winter, and Spring Quarters.

This course consists of conferences, assigned readings, and reports for minor investigations.

701-702-703. Introduction to Analysis. Five credit hours. Autumn and Spring Quarters. Mr. Rado.

The main objective is to train the student to comprehend, and apply intelligently in problems, various basic notions and methods of analysis. The subject matter is chosen from such topics as point sets, the real continuum, infinite series and products, graphical and numerical computation, measure, Riemann integral, curvilinear and multiple integrals, implicit functions, Fourier series.

721. Mathematical Methods in Science I. Five credit hours. Autumn Quarter. General prerequisites must include Mathematics 601, 611, or Mathematics 608, 609, 610, or permission of the instructor. Mr. Alden.

Linear differential equations with continuous coefficients, solutions about regular singular points; special functions, Bessel functions and Legendre polynomials; Sturm-Liouville systems; generalized Fourier series; boundary value problems, solutions of Laplace's equation in rectangular, polar, cylindrical, and spherical coordinates.

* Not given in 1954-1955.

722. Mathematical Methods in Science II. Five credit hours. Winter Quarter. General prerequisites must include Mathematics 601, 611 or Mathematics 608, 609, 610 or permission of the instructor. Mathematics 722 may be taken without 721. Mr. Alden.

Orthonormal sets of functions; formulation of typical problems in the calculus of variations with classical necessary conditions: Lagrange's equations of motion and Hamilton's principle; applications to physical problems and Sturm-Liouville systems. Tensor analysis with applications to elasticity, classical mechanics, and relativity.

723. Mathematical Methods in Science III. Five credit hours. Spring Quarter. General prerequisites must include fifteen hours of mathematics on the 600 and 700 level or equivalent, and permission of the instructor. Mathematics 723 may be taken without 721 or 722. Mr. Alden.

Theory of determinants and matrices; real quadratic and hermitian forms; applications to problems in physics and engineering. Fundamentals of the theory of finite groups; factor groups, characteristic theory; applications.

731. Probability and Statistics. Five credit hours. Autumn Quarter. General prerequisites must include Mathematics 601. Mr. Mann.

Combinatorial probability. Non-parametric tests. The binomial, multinomial, and Poisson distribution laws. Distribution functions. Riemann-Stieltjes integrals. Moments and characteristic function. The limit theorems of probability. Derivations of the distribution of test statistics. Applications.

***732. Theory of Statistical Inference.** Five credit hours. Winter Quarter. General prerequisites must include Mathematics 731. Mr. Mann.

Theory of testing hypotheses and estimation. The power of a test. Most powerful and asymptotically most powerful tests. Maximum likelihood estimates, consistency, sufficiency and efficiency of an estimate. Methods of least squares. Statistical inference from non-experimental data.

733. Statistics: Design and Analysis of Experiments. Five credit hours. Winter Quarter. General prerequisites must include Mathematics 672 or 732. Mr. Mann.

The analysis of variance distribution. Likelihood ratio tests. Tests of linear hypothesis. Analysis of variance in an r-way classification. Non-orthogonal data. Randomized blocks, Latin squares, incomplete balanced blocks, lattices and lattice squares.

741-742-*743. Introduction to Higher Geometry. Five credit hours. Winter and Spring Quarters. General prerequisites must include Mathematics 601 or permission of the instructor. Mr. Calderon.

This course is designed to give basic training in the area of modern geometry. Topics will be selected from topology, differential geometry, and projective geometry.

761-762-763. Introduction to Higher Algebra. Five credit hours. Autumn, Winter and Spring Quarters. General prerequisites must include permission of the instructor. 761, 762, Mr. Kleinfeld, 763, Mr. Ryser.

Groups, rings, fields, ideals; selected topics from Galois theory, lattice theory, and the theory of rings with minimum condition.

798. Advanced Studies in Mathematics. Two to five credit hours each Quarter, with total credit in the course not to exceed fifteen hours. Autumn, Winter, and Spring Quarters. General prerequisites must include permission of the instructor.

When student need is sufficient, the Department will offer under this number a course on some phase of advanced Mathematics not covered in its regular offerings.

NOTE: TEACHING COURSES. For the Teaching Course in this department see the Department of Education, Course 687.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

NOTE: Students should consult with instructors before registering for courses open only to graduates.

* Not given in 1954-1955.

***801-*802-*803. Theory of Functions of a Complex Variable.** Five credit hours. Autumn, Winter, Spring. General prerequisites must include Mathematics 601 or permission of the instructor. Mr. Helsel.

The complex number system. Analytic functions. Theorems of Cauchy and Goursat. Expansions. Singularities. Special functions. Conformal mapping. Harmonic and subharmonic functions. The theorem of Picard and related topics.

***807-*808-*809. Ordinary and Partial Differential Equations.** Three credit hours. Autumn and Winter Quarters. General prerequisites must include Mathematics 702 or permission of the instructor.

Existence theorems; properties of solutions depending upon initial conditions and parameters; geometrical properties of solutions; dynamical systems; stability of solutions; linear differential equations. Applications to problems in engineering, physics, chemistry.

***810-*811-*812. Calculus of Variations.** Three credit hours. Autumn, Winter, and Spring Quarters. General prerequisites must include Mathematics 703 or permission of the instructor. Mr. Reichelderfer.

Formulation of typical problems; classical necessary conditions; the Jacobi condition and the criteria for conjugate points due to Blas; imbedding theorems and the Weierstrass sufficiency proof; the Hamilton-Jacobi theory; double integral problems; inverse problems and direct method in the calculus of variations; applications.

***815. Dimension Theory.** Five credit hours. Autumn Quarter. General prerequisites must include Mathematics 702, 742, and 762, or the equivalent. Mr. Reichelderfer.

The concept of dimension in separable metric spaces. Application of this concept to Euclidean spaces. Covering theorems. Imbedding theorems. Approximation theorems. Mappings. Relationships between the concepts of dimension and measure.

826-827-828. Measure and Integration. Five credit hours. Autumn, Winter, and Spring Quarters. General prerequisites must include Mathematics 701-702-703, or evidence of equivalent background. Mr. Reichelderfer.

Invariant measure in general spaces. Integration in abstract spaces and in euclidean spaces of arbitrary dimension. Additive set functions. Applications to special topics in arc length, surface area, and the calculus of variations.

***841-*842. Differential Geometry.** Five credit hours. 841, Winter Quarter; 842, Spring Quarter. General prerequisites must include Mathematics 743 or permission of the instructor. Mr. Rado.

Review of fundamental notions. Applications of the general theory to special problems, in particular to problems in the large and to variation problems arising in connection with length, area, volume, curvature.

***844-*845. Combinatorial Topology.** Five credit hours. Winter and Spring Quarters. General prerequisites must include Mathematics 702, 742, and 762, or the equivalent.

Homology and cohomology of simplicial and of abstract complexes. Duality, Relative homology and cohomology groups in the simplicial case. Discussion of the axiomatic approach. Extension of the theory to general spaces with special emphasis upon the Čech theory and the singular theory. Applications to selected problems in geometry and in analysis.

***861. Theory of Fields.** Three credit hours. Autumn Quarter. General prerequisites must include Mathematics 763. Mr. Mann.

Transfinite induction, algebraic closure of a field, formally real fields and their real closure, theory of valuations, transcendental extensions.

862. Theory of Matrices. Five credit hours. Autumn Quarter. General prerequisites must include Mathematics 763. Mr. Ryser.

Advanced topics in the theory of matrices

***864. Combinatorial Analysis.** Five credit hours. Autumn Quarter. General prerequisites must include permission of the instructor. Mr. Hall.

Permutations, combinations, and partitions; enumerations by recursions or generating functions; block designs and other tactical configurations such as Latin squares, Steiner triples, and finite geometries; incidence matrices.

* Not given in 1954-1955.

865. Lattice Theory. Five credit hours. Autumn Quarter. General prerequisites must include Mathematics 761-762. Mr. Hall.

An introduction to the theory of partially ordered sets, and in particular to lattices. Distributive and modular lattices. Relations to Boolean Algebras and Projective Geometries. Applications to the theory of groups and rings.

***867. Linear Algebras.** Three credit hours.

A study of linear algebras and their arithmetics, with particular attention to Dickson's theory of hypercomplex integers.

871-872. Group Theory. Five credit hours. Winter and Spring Quarters. Mr. Hall.

Basic theorems on subgroups, normal subgroups, homomorphisms, automorphisms; Sylow theorems; composition series and chief series; selected topics from free groups, extension theory, and other areas of current research.

***873. Analytic Number Theory.** Five credit hours. Spring Quarter. General prerequisites must include permission of the instructor. Mr. Mann.

The distribution of prime numbers. Waring's problem. Selected topics.

***874. Continuous Groups.** Three credit hours. Mr. Mickle.

A study of Lie's theory of r -parameter continuous groups with an introduction to some of the recent investigations of Cartan and Weyl.

***880-881. Theory of Algebraic Numbers.** Five credit hours. Autumn and Winter Quarters. Mr. Mann.

Ideals in algebraic number fields, unique decomposition into prime ideals, differentia and discriminant, ideal classes, applications of Galois theory and analytical methods to the theory of algebraic numbers, distribution of prime ideals.

950. Research in Mathematics. Autumn, Winter, and Spring Quarters. Library work and conferences. General prerequisites must include permission of the Department of Mathematics.

MECHANICAL ENGINEERING

Office, 247 Robinson Laboratory

PROFESSORS MARCO, MARQUIS (EMERITUS), NORMAN (EMERITUS), BEITLER, BROWN, BUCHER, HUCKERT, ROBERTS, AND STINSON. ASSOCIATE PROFESSORS ROBINSON, AND ZIMMERMAN, ASSISTANT PROFESSORS HUDELSON, SMITH, AND STARKEY

Prerequisites for Graduate Work: For major work a student must hold a baccalaureate degree in mechanical engineering or its equivalent and his application must be approved by the department's committee on graduate work. A student desiring to work for a Master's degree in this field must have at least a 2.5 point-hour ratio for all his undergraduate work and a 2.70 point-hour ratio in the mechanical engineering courses, on the basis of the grading system at this University.

For a statement of the requirements applying to undergraduates in the combined B.M.E. and M.Sc. curriculum at this University, see page 34.

The application of a student desiring to work for the degree Doctor of Philosophy in this field must be approved by the department's committee on graduate work when he has received the Master's degree, or after he has received the approval of the Graduate Council in case part of the work is done elsewhere than in this University.

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

These general prerequisites include fundamental courses in mathematics, physics, and mechanics.

The following courses do not carry graduate credit for students who have received a Bachelor's degree in Mechanical Engineering: 601, 602, 603, 604, 606, 611, 615, 621, 625, 710, 726, 727, 728, 735, 736, 742, 743, 744, 779, and 780.

601. Thermodynamics. Five credit hours. One Quarter. Autumn, Winter, Spring. Five class hours each week. Mr. Bucher, supervisor.

The beginning of a study of engineering thermodynamics; an analytical study of laws which govern energy transformation.

* Not given in 1954-1955.

602. Thermodynamics and Fluid Flow. Five credit hours. One Quarter. Winter and Spring. Five class hours each week. General prerequisites must include Mechanical Engineering 601 or 604. Mr. Beidler, supervisor.

The continuation of Mechanical Engineering 604 including fluid flow.

603. Steam Power Engineering. Three credit hours. One Quarter. Winter and Spring. Three class hours each week. General prerequisites must include Mechanical Engineering 602 and 606. Mr. Bucher, supervisor.

A descriptive and analytical study of steam-generating and steam-using equipment.

604. Thermodynamics. Five credit hours. One Quarter. Autumn and Winter. Five class hours each week. General prerequisites must include Mechanical Engineering 600 or equivalent. Mr. Zimmerman, supervisor.

A study of the fundamentals of engineering thermodynamics.

606. Combustion. Four credit hours. One Quarter. Winter and Spring. Four class hours each week. General prerequisites must include Mechanical Engineering 601 or 604. Mr. Smith, supervisor.

A study of the combustion and utilization of solid, liquid, and gaseous fuels.

611. Heat Transfer. Three credit hours. One Quarter. Autumn, Winter, Spring. Three class hours each week. General prerequisites must include Mechanical Engineering 602 or Mechanical Engineering 601 and Aeronautical Engineering 671. Mr. Brown, supervisor.

A study of the fundamental laws of heat transfer including application to heat exchange equipment.

615. Kinematics of Machines. Five credit hours. One Quarter. Autumn and Spring. Three class hours and two three-hour laboratory periods each week. General prerequisites must include a course in engineering drawing. Mr. Huckert, supervisor.

A classroom and drawing-board study of mechanisms and kinematics of machines.

621. Heat Transfer and Fluid Flow. Five credit hours. Spring Quarter. Five class hours each week. General prerequisites must include Mechanical Engineering 601. Mr. Brown, supervisor.

A study of the fundamental principles of heat transfer and fluid flow in the design of heat exchange equipment with applications to electrical machinery and apparatus.

625. Fundamentals of Internal Combustion Engines and Turbines. Three credit hours. One Quarter. Autumn and Winter. Three class hours each week. General prerequisites must include Mechanical Engineering 602 and 606; or Mechanical Engineering 601, Mechanics 610 and Metallurgy 651. Mr. Stinson, supervisor.

A study of internal combustion engines, turbines and their auxiliaries.

703. Internal Combustion Engines. Three credit hours. Autumn Quarter. Three class hours each week. General prerequisites must include Mechanical Engineering 625. Mr. Stinson, supervisor.

A study of combustion chambers, valve mechanism, and the dynamic balance of internal combustion engines.

704. Internal Combustion Engines. Three credit hours. Winter Quarter. Three class hours each week. General prerequisites must include Mechanical Engineering 625. Mr. Stinson, supervisor.

Force analysis as related to the design of engine components such as pistons, bearings, valve springs, and crankshafts.

710. Heating, Ventilating, and Air Conditioning. Four credit hours. One Quarter. Winter and Spring. Four class hours each week. General prerequisites must include Mechanical Engineering 611. Mr. Brown, supervisor.

A study of the heating and cooling requirements of buildings; fundamentals of design of various systems and the application of mechanical equipment to such systems.

716. Refrigeration and Air Conditioning. Three credit hours. Spring Quarter. Three class hours each week. General prerequisites must include Mechanical Engineering 710. Mr. Brown, supervisor.

A study of the processes of machinery used in refrigeration, and of the methods and equipment used for controlling conditions of air for comfort, health, and industrial purposes.

725. Diesel Engines. Three credit hours. Spring Quarter. Three class hours each week. General prerequisites must include Mechanical Engineering 625. Mr. Stinson, supervisor.

An advanced study of Diesel-engine design, operation and economics.

726. Gas Turbine Power Plants. Three credit hours. One Quarter. Winter and Spring. Three class hours each week. General prerequisites must include Mechanical Engineering 625. Mr. Zimmerman, supervisor.

A study of the principles, performance, and design of gas turbine power plants, including superchargers.

727-728. Machine Design. Five credit hours each Quarter. 727, Spring; 728, Autumn. Five class hours each week (727); three class hours and two three-hour laboratory periods each week (728). General prerequisites must include Mechanics 605 and 607, and Mechanical Engineering 615 and 627. Mr. Starkey, supervisor.

A study of the principles and methods applied to the design and construction of machinery.

735. Machine Design. Three credit hours. One Quarter. Winter and Spring. Three class hours each week. General prerequisites must include Mechanics 602. Mr. Starkey, supervisor.

A study of the fundamental concepts involved in the design of machinery. Taken into consideration are such factors as mechanism selection, force analysis, impact, fatigue, creep, stress concentration, bi-axial stresses, factor of safety, materials, and manufacturing processes.

736. Machine Design. Five credit hours. One Quarter. Autumn, Winter, Spring. Five class hours each week. General prerequisites must include Mechanics 602. Mr. Starkey, supervisor.

A study of machine components with respect to their function, limitations, and basic design characteristics. Included are such topics as shafts, bearings, gears, belts, brakes, clutches, flywheels, springs, wire rope, screw threads, pressure vessels, linkage, and machine frames.

740. Professional Aspects of Mechanical Engineering. Four credit hours. Spring Quarter. Four class hours each week. Mr. Huckert, supervisor.

A study of the technical, ethical, and economic factors to be considered in making engineering decisions.

742. Hydraulic Machinery. Three credit hours. One Quarter. Autumn and Spring. Three class hours each week. General prerequisites must include Mechanical Engineering 602 or Mechanics 610. Mr. Beitler, instructor.

The application of hydraulic principles to machinery.

743. Machine Design. Three credit hours. Winter Quarter. Three class hours each week. General prerequisites must include Mechanical Engineering 728. Mr. Starkey, supervisor.

The continuation of Mechanical Engineering 728.

744. Machine Design. Five credit hours. Winter Quarter. Three class hours and two three-hour laboratory periods each week. General prerequisites must include Mechanical Engineering 728. Mr. Starkey, supervisor.

The continuation of Mechanical Engineering 728.

745. Steam Power Plants. Three credit hours. Spring Quarter. Three class hours each week. General prerequisites must include Mechanical Engineering 603. Mr. Bucher, supervisor.

A continuation of Mechanical Engineering 603.

754. Industrial Hydraulics. Three credit hours. Winter Quarter. Three class hours each week. General prerequisites must include Mechanical Engineering 742 or 673. Mr. Beitler, supervisor.

A study of the principles and methods in industrial hydraulics, including power generation and transmission.

760. Instruments and Controls. Three credit hours. Spring Quarter. Three class hours each week. General prerequisites must include Mechanical Engineering 600 or equivalent and 664. Mr. Beitler, supervisor.

A study of the principles and operation of instruments and controls associated with mechanical apparatus.

779. Mechanical Engineering Laboratory. Three credit hours. One Quarter. Autumn and Winter. One four-hour laboratory period and five hours of laboratory report writing each week. General prerequisites must include Mechanical Engineering 665. Mr. Bucher, supervisor.

Advanced mechanical engineering laboratory, including steam boiler experiments.

780. Mechanical Engineering Laboratory. Three credit hours. One Quarter. Autumn, Winter, Spring. One four-hour laboratory period and five hours of laboratory report writing each week. General prerequisites must include Mechanical Engineering 625 and 665. Mr. Roberts, supervisor.

Advanced mechanical engineering laboratory, including internal combustion engine experiments.

798. Advanced Studies in Mechanical Engineering. Three to five credit hours. This course may be repeated to a total of fifteen credit hours. Autumn, Winter, and Spring Quarters. General prerequisites must include permission of the instructor. All instructors.

Advanced topics in the various phases of Mechanical Engineering. The particular topic, the number of credit hours, and instructor will be announced in the Quarter previous to the one in which the course is to be offered.

799. Special Problems in Advanced Mechanical Engineering. Two to ten credit hours. Autumn, Winter, and Spring Quarters. General prerequisites must include the permission of the instructor. All instructors.

This course is intended to give the advanced student opportunity to pursue special studies not otherwise offered. Work undertaken will be selected from automotive and internal combustion machinery, combustion and fuels, heat transfer, heating, ventilating, and air conditioning, industrial hydraulics, machine design, refrigeration, steam power plants, and thermodynamics.

A student may repeat this course until he has obtained a maximum of twenty-hour credit hours. He may accumulate not more than ten hours in any one of the above subdivisions.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

These prerequisites include a collegiate course in mechanics, strength of materials, machine design, steam or gas engines and knowledge of the fundamentals of hydraulics.

801-802. Advanced Applied Thermodynamics. Three credit hours each Quarter. 801, Autumn; 802, Winter. Three class hours each week. General prerequisites must include Mechanical Engineering 601 or 604 and Mathematics 608 or equivalent. Mr. Zimmerman.

An analytical study of the thermodynamics of fluid flow, accurate equations of state, the application of the kinetic theory of gases to engineering problems, and a continuation of Mechanical Engineering 604.

807-808. Advanced Heat Transfer. Three credit hours each Quarter. 807, Winter; 808, Spring. Three class hours each week. General prerequisites must include Mechanical Engineering 611 and Mathematics 608 and 609 or equivalent. Mr. Marco.

A study of the general heat transfer equations and their application to heat transfer in solids and through fluids. The use of numerical and graphical analysis will be included.

810-811. Internal Combustion Power Plants. Three credit hours each Quarter. 810, Autumn; 811, Winter. Three class hours each week. General prerequisites must include Mechanical Engineering 625. Mr. Stinson, Mr. Zimmerman.

An advanced study of reciprocating and rotating internal combustion power plants.

812. Advanced Internal Combustion Power Plant Problems. Credit hours to be arranged. Autumn, Winter, and Spring Quarters. General prerequisites must include Mechanical Engineering 810 or 811. This work may include conferences, library, drawing board and laboratory work. Mr. Stinson, Mr. Zimmerman.

820. Refrigeration. Three credit hours. Autumn Quarter. Three class hours each week. General prerequisites must include Mechanical Engineering 710. Mr. Brown.

A study of the theory and practice of refrigeration.

821. Advanced Air Conditioning. Three credit hours. Winter Quarter. Three class hours each week. General prerequisites must include Mechanical Engineering 710. Mr. Brown.

An advanced study of the principles of air conditioning.

822. Advanced Heating, Ventilating and Air Conditioning Problems. Credit hours to be arranged. Autumn, Winter, and Spring Quarters. General prerequisites must include permission of the instructor. This work may include conferences, library, drawing board and laboratory work. Mr. Brown.

830-831. Advanced Steam Power Plants. Three credit hours each Quarter. 830, Autumn; 831, Winter. Three class hours each week. General prerequisites must include Mechanical Engineering 603. Mr. Bucher.

An advanced study of steam power plants, cycles, and components.

832. Advanced Steam Power Plant Problems. Credit hours to be arranged. Autumn, Winter, and Spring Quarters. General prerequisites must include Mechanical Engineering 830 or 831. This work may include conferences, library, drawing board and laboratory work. Mr. Bucher.

840. Advanced Machine Design Analysis. Three credit hours. Autumn Quarter. Three class hours each week. General prerequisites must include Mechanical Engineering 727. Mr. Marco.

The application of modern theories of failure, such as fatigue and creep, to the determination of safe working stresses.

841. Dynamics of High Speed Machinery. Three credit hours. Winter Quarter. Three class hours each week. General prerequisites must include Mechanical Engineering 727 and Mathematics 608 and 609 or equivalent. Mr. Marco.

Determination of forces acting in high speed machinery; effects of centrifugal, inertia and vibratory forces; methods of balancing, damping, and absorbing dynamic loads in machinery.

842. Advanced Machine Design Problems. Credit hours to be arranged. Autumn, Winter, and Spring Quarters. General prerequisites must include Mechanical Engineering 840 or 841. This work may include conferences, library, drawing board and laboratory work. Mr. Marco.

850. Advanced Fluids Dynamics. Three credit hours. Autumn Quarter. Three class hours each week. General prerequisites must include Mechanical Engineering 602 and Mathematics 608 or equivalent. Mr. Beitler, Mr. Zimmerman.

An advanced study of the dynamics of fluids.

851. Advanced Hydraulic Machinery. Three credit hours. Winter Quarter. Three class hours each week. General prerequisites must include Mechanical Engineering 742 and 850. Mr. Beitler.

An advanced study of the theory of pumps, turbines, and hydraulic servo-mechanisms.

852. Advanced Hydraulic Problems. Credit hours to be arranged. Autumn, Winter, and Spring Quarters. General prerequisites must include Mechanical Engineering 850 or 851. This work may include conferences, library, drawing board and laboratory work. Mr. Beitler.

950. Research in Mechanical Engineering. Credit hours to be arranged. Autumn, Winter, and Spring Quarters.

Courses carrying this number involve research problems selected by the student in consultation with his adviser.

MECHANICS

(See Engineering Mechanics)

MEDICINE

Office, Kinsman Hall

PROFESSORS WISEMAN, DOAN, AND STAFF

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

750. Principles of Hematology. One credit hour. Winter Quarter. General prerequisites must include Anatomy 624 or its equivalent and the permission of the instructor must be obtained. Mr. Doan and staff.

A seminar and laboratory course meeting. The normal human and comparative blood pictures including a study of the normal hematogenic organs will be emphasized, but sufficient pathological material will be introduced to establish the limits for the range of normal. Each student will be expected to select some special phase of the field and develop it thoroughly with an adequate survey of the current literature, to be organized for presentation before the group at some time during the course. Independent work will be encouraged. Limited to a maximum of twenty-five students.

780. Minor Problems. One to five credit hours. All Quarters. Library, conference and laboratory work. General prerequisites must include adequate preclinical training and satisfactory scholarship in regular required course work. Permission of the Director of the Department is required.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

950. Medical Research. All Quarters. Library, conference, and laboratory work. General prerequisites must include acceptable courses in the basic preclinical sciences, and proof of an interest in and the ability to undertake the selected project. The student may spend a part or all of his time in research work and he must be registered in the Graduate School. Permission of the Director of the Department is required. Mr. Wiseman and staff.

METALLURGY

Office, 100 Lord Hall

PROFESSORS FONTANA, DEMOREST (EMERITUS), AND MUELLER, ASSOCIATE PROFESSORS LORD, SPEISER, AND SPRETNAK

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

These general prerequisites include fundamental courses in physics and metallurgy.

All 600 courses and courses 703, 704, 705, and 706 do not carry graduate credit for students in the Department of Metallurgy.

605. Iron and Steel Metallurgy. Three credit hours. Winter Quarter. Three lectures or recitations each week. General prerequisites must include Metallurgy 651 or take concurrently. Mr. Demorest.

Lecturers and problem work on the production of pig iron, open hearth, bessemer and electric steel and malleable cast iron and the rolling and forging of steel shapes. Calculation of furnace charges and application of thermodynamics to the equilibria approached in metallurgical operations.

610. Non-ferrous Metallurgy. Five credit hours. Spring Quarter. Five recitations each week. General prerequisites must include one year of college physics and college chemistry. Mr. Mueller.

Metallurgy and properties of the common non-ferrous metals. The chemical principles of the reduction of base metals from their ores. Refining and preparation for the market from the standpoint of physical and operative metallurgical principles. The igneous solution of impurities and concentration of precious metals in common base metals from the standpoint of theoretical equilibrium diagrams. The common hydro-metallurgical processes for copper, zinc, gold, and silver, and their possible applications to other metals. General principles of electro-metallurgy of the common metals for igneous and hydro-metallurgical applications. The study of slags and their equilibrium diagrams as related to the reduction of ores, refining of base metals and relation of slags to furnace and ladle linings.

620. Principles of Ore Dressing and Coal Cleaning. Five credit hours. Autumn Quarter. Four lectures or recitations and one three-hour laboratory period each week. General prerequisites must include a course in descriptive mineralogy and a year of college physics. Mr. Mueller.

An introduction to the field of mineral dressing. Fundamental principles of mineral and coal preparation for economic uses. Principles and design of crushers and grinders. Wet and dry classifiers and screens. Principles of mineral separations by various processes, such as use of jigs, tables, magnetic and electrostatic separators, trough separators and flotation. Principles and equipment used for settling, thickening and filtration of concentrates, tailings and coal. Flow sheets of plants.

650. Pyrometry. Two credit hours. One Quarter. Autumn and Winter. One lecture or recitation and one three-hour laboratory period each week. Mr. Lord.

Lectures, laboratory, and problem work on the calibration and use of thermoelectric, optical, and total radiation pyrometers.

651. Fuels. Three credit hours. One Quarter. Autumn and Winter. Three lectures or recitations each week. Mr. Demorest, Mr. Mueller.

Origin and manufacture of solid, liquid and gaseous fuels. Chemical compositions and variations of fuels. Carbonization and destructive distillation processes. Gasification processes. Thermochemistry and thermodynamics of combustion and gas reactions with much problem work.

660. Metallography. Four credit hours. One Quarter. Autumn and Spring. Two lectures, two three-hour laboratory periods each week. General prerequisites must include one year of college physics and two Quarters of college chemistry. Mr. Lord.

An elementary course in physical metallurgy. Study of structures of metals and alloys by use of the microscope. The relation of microstructure to the thermo-chemical equilibrium diagram. Problems in the quantitative distribution of structural features. Laboratory work in preparation of metal specimens for microscopic study, followed by correlation of heat and mechanical treatment with structure and an introduction to the technique of taking photographs with the microscope.

703. Physical Metallurgy of Iron and Steel. Three credit hours. Winter Quarter. Two lectures and one three-hour laboratory period each week. General prerequisites must include Metallurgy 660. Mr. Lord.

Physical metallurgy applied to iron-carbon alloys. Special treatments and processes. Sub-critical transformation studies, case carburizing, cyaniding, nitriding; cast iron and malleabilization. Laboratory work in the application of these processes and study with the microscope of structures produced.

704. Physical Metallurgy of Alloy Steels and Non-Ferrous Alloys. Three

credit hours. Spring Quarter. Two lectures and one three-hour laboratory period each week. General prerequisites must include Metallurgy 703. Mr. Lord.

Lectures and recitations on structures, properties and heat treatment of alloy steels, copper and copper alloys, viz., brass and bronze; aluminum and aluminum alloys and magnesium and magnesium alloys. Library assignments on current developments in these alloys. Laboratory work in heat treatment of special steels and casting and working the other alloys. Microscopic studies of structures.

705. Metallurgical Construction. Three credit hours. Winter Quarter. Three lectures or recitations each week. General prerequisites must include Metallurgy 651, 605, 720, 610. Mr. Mueller.

Principles, practice and design of concentrators and coal-washing plants. Study of flow sheets for milling processes; location of plants and accessory equipment. Relation of plants to climatic and topographic conditions, health hazards and power facilities. Consideration of equipment for various conditions and purposes, labor requirements and housing of same.

706. Metallurgical Construction. Three credit hours. Autumn Quarter. Three lectures or recitations each week. General prerequisites must include Metallurgy 605, 610, and 651. Mr. Demorest.

Lectures, recitations, and drawing-room practice on the principles, practice, and design of metallurgical furnaces and plants with special reference to refractories and heat transfer.

709. Advanced Fuel Testing and Problems. Four credit hours. Spring Quarter. Two lectures and two three-hour laboratory periods each week. General prerequisites must include Metallurgy 651. Mr. Demorest.

Problems and advanced laboratory work in fuel and gas testing. Thermodynamics of combustion and fuel production and utilization. Gas distribution and corrosion of pipes.

710. Metallurgical Investigation. Three to five credit hours. This course may be repeated for a total of nine hours credit. Three Quarters. Autumn, Winter, Spring. One recitation or lecture and two to four three-hour laboratory periods each week. General prerequisites must include permission of the department. Mr. Mueller, Mr. Lord, Mr. Fontana, Mr. Spretnak, Mr. Speiser.

The class is divided into groups for investigation along the lines of their special interests as follows:

- (a) The Properties of Metals and Alloys.
- (b) Production and Refining of Metals.
- (c) Mineral and Coal Beneficiation.
- (d) Fuels.
- (e) Metallurgical Equilibria.
- (f) Corrosion Engineering.

All investigations are under the close direction of the instructors. A comprehensive report is required.

713. The Production of the Light Metals. Three credit hours. Autumn Quarter. Three lectures or recitations each week. General prerequisites must include Metallurgy 605 and 651. Mr. Mueller.

Lectures and problem work on the light metal ores and their preparation and the production and refining of the metals.

715. Advanced Steel Making. Three credit hours. Spring Quarter. Three lectures each week. General prerequisites must include Metallurgy 605. Mr. Demorest.

Lectures and problems on the making of steel in the Bessemer, Electric and Open Hearth furnaces from the Thermodynamic point of view and the metallurgical aspects of making of steel.

720. Advanced Ore Dressing. Three credit hours. Winter Quarter. Two lectures and one three-hour laboratory period each week. General prerequisites must include Metallurgy 620. Mr. Mueller.

Design of flow sheets for ore concentration, coal cleaning and non-metallic mineral separation. The general technique of cyanidation of gold ores and other leaching processes and the refining of the recovered products.

730. Corrosion of Metals and Alloys. Three credit hours. One Quarter. Autumn and Spring. Two lectures and two hours of laboratory each week. Mr. Fontana.

Theory and forms of corrosion with a study of the variables involved. Methods of corrosion testing and actual testing in laboratory. Interpretation and expression of corrosion data. Methods of combating corrosion. Properties and uses of corrosion-resistant materials.

731. Advanced Corrosion. Three credit hours. One Quarter. Autumn and Winter. Three lectures or recitations each week. General prerequisites must include Metallurgy 730. Mr. Fontana.

Advanced studies of corrosion with emphasis on theory. Designing of equipment to minimize corrosion. Study of new developments in corrosion and corrosion resistant materials. Review of outstanding literature. The reporting and interpretation of corrosion data. Economic considerations of corrosion resistant equipment.

735. Mechanical Metallurgy. Three credit hours. Winter Quarter. Three lecture periods each week. General prerequisites must include Mechanics 601 and 602 and Metallurgy 704. Mr. Spretnak.

Behavior of metals under applied simple and combined stress systems. The subjects discussed include theory of elasticity, fundamentals of plasticity, plastic deformation, recrystallization, and interpretation of mechanical test results.

740. Advanced Physical Metallurgy. Three credit hours. Autumn Quarter. Three lecture periods each week. General prerequisites must include Metallurgy 660, 703 and 704. Mr. Spretnak.

Nucleation theory, preparation of single crystals, metallic crystals and grains, microstructure of metals and alloys. Discussion of phase diagrams of alloys by X-ray methods. Detritation hardening.

745. Shaping and Forming of Metals. Three credit hours. Spring Quarter. Three lecture periods each week. General prerequisites must include Metallurgy 735. Mr. Spretnak.

Fundamental aspects of deformation of metals by forging, rolling, wire drawing, tube drawing, extrusion, piercing, and deep drawing.

755. Metallurgy of Cast Metals. Three credit hours. Winter Quarter. Three lecture periods each week. General prerequisites must include Metallurgy 660.

Survey of melting procedures, fundamentals of freezing of metals in molds, including directional solidification, gases in metals, cast structure and properties, and heat treatment.

760. Engineering Metallurgy. Three credit hours. Autumn Quarter. Three lectures each week. General prerequisites must include Metallurgy 704. Mr. Spretnak.

Selection of metals and alloys for various engineering applications. Discussion of statistical methods in metallurgical investigations and application to evaluation of quality characteristics of engineering metals. Basic feature of service failures. Non-destructive testing.

770-771-772. Theory and Properties of Metals. Three credit hours each. 770, Autumn and Spring Quarters; 771, Winter Quarter; 772, Spring Quarter. Three lectures or recitations each week. General prerequisites must include Metallurgy 704, Chemistry 683 and Mathematics 608 or permission of the instructor. Mr. Speiser.

Interpretation of developments in modern theories of the metallic state and their relations to the physical properties of metals. Subjects include dependence of physical properties on structure; regularities in the constitution of alloy systems; stability of alloy systems; plastic deformation; reorientation of crystals during deformation and recrystallization; preferred orientation; cleavage and cohesion; and diffusion of metals.

780. Structure of Metals and Alloys. Three credit hours. Autumn Quarter. Three lectures or recitations each week. General prerequisites must include Mathematics 608, 609, 610, and Chemistry 683 or permission of the instructor. Mr. Speiser.

Application of X-ray diffraction and electron diffraction theory to the study of the structure in terms of interfacial tensions, alloy systems, decomposition of austenite, diffusion, precipitation of pole figures and orientation.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

801. Graduate Seminar. One credit hour. Autumn, Winter, and Spring Quarters. Required of all graduate students in the Department of Metallurgy. This course may be repeated provided the total credit does not exceed six hours. Mr. Fontana and staff.

Discussion of current thesis problems and outstanding current literature in Metallurgy. Round table discussion of selected metallurgical topics.

835. Advanced Mechanical Metallurgy. Three credit hours. Spring Quarter. Three lecture periods each week. General prerequisites must include Metallurgy 735. Mr. Spretnak.

Detailed discussion of elasticity, plasticity, plastic deformation, dislocation theory of plastic deformation, fracture, and mechanical testing.

844. Metallurgical Thermodynamics. Three credit hours. Winter Quarter. Three lectures or recitations each week. Open to graduate students in Metallurgical Engineering who have credit for at least six hours in "700" level courses in Metallurgy and to other students on permission of the instructor. Mr. Speiser.

The application of thermodynamics to the study of metallurgical reactions and operations with emphasis on the practical aspects of thermodynamics in metallurgy. The use of thermodynamics to determine the feasibility and limitations of metallurgical reactions and the calculation of equilibria. Solution of actual problems.

845. Metallurgical Thermodynamics. Three credit hours. Spring Quarter. Three lectures and recitations each week. General prerequisites must include Metallurgy 844. Mr. Speiser.

Continuation of Metallurgy 844 with major emphasis on practical applications. Numerous problems.

880. Structure of Metals and Alloys. Three credit hours. Winter Quarter. Three lectures or recitations each week. General prerequisites must include Metallurgy 780 or permission of the instructor. Mr. Speiser.

Application of X-ray diffraction and electron diffraction theory to the study of the structure of metals and alloys. Study of superlattices, order-disorder, stress measurements by X-rays and the texture of deformed metals. Study of surface films by electron diffraction methods.

950. Research in Metallurgy. Autumn, Winter, and Spring Quarters. Mr. Fontana, Mr. Mueller, Mr. Lord, Mr. Spretnak, Mr. Speiser.

METEOROLOGY

Courses in meteorology are offered within the Department of Physics and Astronomy. Students interested in this field should confer with Professor Nelson Dingle, Room 403, New Physics Building.

MINERALOGY

Office, 140 Lord Hall

PROFESSORS McCONNELL AND McCaughey (EMERITUS),
ASSOCIATE PROFESSOR FOSTER, ASSISTANT PROFESSOR LEVINSON

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51. These prerequisites include fundamental courses in crystallography and mineralogy.

***601. Advanced Crystallography.** Five credit hours. Spring Quarter. Mr. Levinson.

Study of the thirty-two crystal groups and their representative crystals. Laboratory practice with the two circle goniometer in the measurement of crystals and in the drawing and projection of crystals.

* Not given in 1954-1955.

605. Thermochemical Mineralogy. Four credit hours, Autumn Quarter. Five credit hours, Spring Quarter. Four or five lectures each week. General prerequisites must include a course in physical chemistry or its equivalent. Mr. Foster.

Thermal properties of minerals. Phase equilibria in mineral systems at high temperatures and the application to problems of refractories, ceramic systems and metallurgical slags.

606. Advanced Thermochemical Mineralogy. Three credit hours. Winter Quarter. Three lectures each week. General prerequisites must include Mineralogy 605. Mr. Foster.

Formation and solid solution of silicate minerals in multiple component systems. Continuation of Mineralogy 605.

621. Microscopic Mineralogy. Five credit hours. One Quarter. Autumn and Spring. Two lectures and three two-hour laboratory periods each week. General prerequisites must include a course in descriptive mineralogy and a college course in physics, covering light. Mr. McConnell, Mr. Foster, Mr. Levinson.

The use of a polarizing microscope in the identification of minerals in fine powder and thin section. Determination of the optical constants of minerals and crystallized substances with the polarizing microscope.

622. Microscopic Petrography. Four credit hours. Winter Quarter. Two lectures and two two-hour laboratory periods each week. General prerequisites must include Mineralogy 621. Mr. McConnell.

Use of the petrographic microscope in the identification of minerals in thin sections of rocks. Microscopic investigation of igneous metamorphic and sedimentary rocks, correlating texture, mineral composition, alteration and geological agencies affecting these.

625. Microscopic Mineralogy. Five credit hours. Winter Quarter. Two lectures and three two-hour laboratory periods each week. General prerequisites must include Mineralogy 605, Ceramic Engineering 620, and a course in physics covering light. Mr. McConnell, Mr. Foster, Mr. Levinson.

The use of a polarizing microscope in the identification of minerals in fine powder. Determination of the optical properties of ceramic minerals and the crystalline phases developed in ceramic technology.

Not open to students who have credit for Mineralogy 621.

631. Mineralogical Investigations. Three to five credit hours. One Quarter. Autumn, Winter, Spring. Library, conference, and advanced laboratory work. General prerequisites must include Mineralogy 621 and permission of the instructor. Mr. McConnell, Mr. Foster.

a. **Microscopic Petrography.** Study and investigation of igneous, metamorphic, and sedimentary rocks in thin section.

b. **Soil Mineralogy.** Mineralogical investigation of loose rock, such as soils, sand, and clays.

c. **Applied Microscopic Mineralogy.** Application of the principles of microscopic mineralogy to the determination of melting and transformation temperature of minerals; microscopic study of refractories, ceramic products, and glasses.

d. **X-ray Crystal Analysis.** Practice in the application of X-rays to the study of minerals and crystallized materials.

754. X-ray Mineral Analysis. Four credit hours. Winter Quarter. Two hours lecture and recitation, and two three-hour laboratory periods each week. General prerequisites must include an acceptable course in crystallography and one year of college physics. Mr. McConnell.

X-ray crystallography, the application and the underlying principles of X-ray crystal analysis for mineral identification, for phase identification in synthetic silicate systems, and in metallurgy. Measurement and calculation for single crystal, powder and back reflection methods.

Not open to students who have credit for Mineralogy 654, Chemistry 654 or Physics 654.

755. Structure of Silicate Minerals. Three credit hours. Spring Quarter.

Three hours lecture and recitation. General prerequisites must include Mineralogy 754 or Chemistry 754 or acceptable courses in crystallography, mineralogy, chemistry and physics. Mr. McConnell.

Application of the principles of crystal structure and isomorphism to study of the physical properties of silicate minerals, including clay minerals.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

801. Seminar in Mineralogy. Three to five credit hours. Autumn, Winter, and Spring Quarters. Mr. McConnell, Mr. Foster.

This course consists of conference and reports on the developments in mineralogical research and their application to the problems of mineralogy, mineral technology, and mining.

950. Research in Mineralogy and Petrography. Autumn, Winter, and Spring Quarters. Library, conference, and laboratory. Mr. McConnell, Mr. Foster.

MINING AND PETROLEUM ENGINEERING

Office, 214 Lord Hall

PROFESSORS ERTL, NOLD (EMERITUS), AND O'ROURKE

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

The following courses do not carry graduate credit for students who received the degree Bachelor of Engineering in Mining from The Ohio State University: 601, 602, 603.

602. Explosives and Rock Work. Three credit hours. Spring Quarter. Three recitations each week. General prerequisites must include a course in chemistry and general geology. Mr. Ertl.

Explosives, quarrying, tunnelling, shaft sinking, dredging and excavating machinery.

704. Mine Gases and Ventilation. Four credit hours. Winter Quarter. Four recitations each week. General prerequisites must include Mining Engineering 603.

Mine Gases, occurrence, detection, chemical and physical properties, physiological effects when breathed. Air flow and control in mines, ventilating fans. Legal requirements for mine ventilation, mine explosions and mine fires. Mine illumination.

707. Mine Equipment. Five credit hours. Winter Quarter. Four class hours and one two-hour computation period each week. General prerequisites must include Mining Engineering 704. Mr. Ertl.

Drainage, hoisting, mine transportation. Theory, mine practice and solution of problems.

721. Petroleum Engineering. Three credit hours. Autumn Quarter. Three recitations each week. General prerequisites must include satisfactory courses in geology, a course in physics, and the permission of the instructor in charge. Mr. O'Rourke.

Development of oil and gas fields, oil recovery methods.

722. Petroleum Engineering. Three credit hours. Winter Quarter. Three recitations each week. General prerequisites must include Mining Engineering 721. Mr. O'Rourke.

Power gathering systems, preparation of crude petroleum for market, storage, transportation.

723. Petroleum Engineering. Two credit hours. Winter Quarter. Two two-hour laboratory periods each week. General prerequisites must include Mining Engineering 721. Mr. O'Rourke.

Laboratory work in examining and testing petroleum bearing rocks.

724. Petroleum Engineering. Three credit hours. Spring Quarter. Three recitations each week. General prerequisites must include Petroleum Engineering 722 and 723. Mr. O'Rourke.

Engineering evaluation of the production possibilities of oil and gas properties.

731. Mine Plant Design. Three credit hours. Spring Quarter. Two recitations and one period of drawing room work each week. General prerequisites must include Mechanics 602. Mr. Ertl.

Materials for mine and petroleum plant structures.

732. Mine Plant Design. Three credit hours. Autumn Quarter. Two recitations and one period of drawing room work each week. General prerequisites must include Mining Engineering 731. Mr. Ertl.

Design of mine structures.

750. Mine or Petroleum Investigations. Three to ten credit hours. Autumn, Winter, and Spring Quarters. Conference, library, and laboratory work. In addition to the general prerequisites, the approval of the instructor must be obtained. This course may be repeated until the student has accumulated not to exceed twenty-four credit hours. Mr. O'Rourke, Mr. Ertl.

a. Study and Investigation of Some Phases of Mine Development and Operation.

b. Study of Mine Ventilation and Laboratory Work with Ventilating Equipment.

c. Study of the Engineering Problems of Petroleum and Natural Gas Exploration, Production, and Transportation.

d. Design of Mines, Mining Plants, or Planning of Petroleum and Natural Gas Field Development.

e. Mine Examinations and Reports, including estimation of mineral reserves, valuation reports, costs, and administration.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

801. Mine Planning and Design. Three to ten credit hours. Autumn, Winter, and Spring Quarters. Conference, library, and laboratory work. General prerequisites must include satisfactory courses in Mining Engineering, mineral beneficiation, and geology and permission of the instructor. Mr. Ertl.

The work of the course is carried on by individual conferences, library, and laboratory work. Examination and testing of petroleum and petroleum-bearing rocks; economic interpretation data, mine design, planning of operations, etc.

802. Petroleum Production and Oil Field Development and Operational Problems. Three to ten credit hours. Autumn, Winter and Spring Quarters. Conferences, library, and laboratory work. General prerequisites must include satisfactory courses in Petroleum Engineering and Geology and permission of the instructor. Mr. O'Rourke.

The work of the course is carried on by individual conferences, library, and laboratory work. Examination and testing of petroleum and petroleum-bearing rocks; economic interpretation and application to problems of primary and secondary recovery.

950. Research in Mining and Petroleum Engineering. Autumn, Winter, and Spring Quarters. Mr. O'Rourke, Mr. Ertl.

Library, conference, laboratory, and field work on some phase of mining or mine operations, or petroleum development, production, and transportation.

MUSIC

Office, 105 Hughes Hall

The School of Music is a member of the National Association of Schools of Music.

PROFESSORS WEIGEL, DIERCKS, LEEDER, GILLILAND, McBRIDE, PHELPS, AND M. WILSON, ASSOCIATE PROFESSORS DIERKER, HARDESTY, MCGINNIS, MOONEY, SLAWSON, THOMAS, AND JONES, ASSISTANT PROFESSORS ANAWALT, EVANS, HELD, KUEHEFUHS, STAIGER, AND VEDDER

GRADUATE STUDY IN MUSIC LEADING TO THE MASTER OF ARTS DEGREE

The degree Master of Arts (Music Major) is conferred by the University at the recommendation of the Graduate School upon fulfillment of the requirements of the several fields of specialization offered.

The School of Music offers several sequences of study at Graduate level which are directed toward preparation in special fields of music as stated below.

Students entering Graduate Study in Music, or Music Education, after being admitted by the Graduate School, should see Mr. Weigel, Room 104, Hughes Hall, for consultation regarding the assignment of a graduate adviser.

AREAS OF SPECIALIZATION AND ADVISERS

1. Theory.....Mr. Phelps, Miss Kuehefuhs
2. Composition.....Mr. Phelps
3. Music Education :
 - (a) Vocal.....Mr. Leeder, Mr. Gilliland, Miss Slawson, Miss Thomas
 - (b) Instrumental.....Mr. McBride, Mr. McGinnis, Mr. Weigel
 - (c) Pedagogy.....Mr. Gilliland, Mr. Hardesty, Mr. McGinnis,
Mr. Evans
4. History and Literature of Music..Miss Dierker, Mr. Held, Miss Kuehefuhs, Mr.
M. Wilson
5. Psychology of Music.....Mr. M. Wilson
6. Physics of Music.....Mr. Shaffer
7. Choral and Church Music.....Mr. Diercks

ADMISSION REQUIREMENTS

The requirements for admission to the Graduate School are as follows:

- (a) For students who have an accredited Baccalaureate degree with a major in Music Education :
 1. 49 Quarter hours of Liberal Arts academic work (including History and Literature of Music).
 2. 54 Quarter hours of professional academic work (including Music Education, Educational Psychology, and Conducting).
 3. 30 Quarter hours of Music Theory (including Sight Singing, Ear Training, Harmony, Form and Analysis, and Instrumentation).
 4. 18 Quarter hours of Major Applied Instrument (9 Quarters).
 5. 11 Quarter hours of Ensemble.
 6. 18 Quarter hours of optional courses.
- A total of 180 Quarter hours, excluding Military Science and Physical Education.
- (b) For students who have an accredited Baccalaureate degree with a Major in Music.
 1. 49 Quarter hours of Liberal Arts academic work (including History and Literature of Music).
 2. 36 Quarter hours of Music Theory (Sight Singing, Ear Training, Harmony, Form and Analysis, Instrumentation and Counterpoint).

REQUIREMENTS FOR THE MASTER OF ARTS DEGREE

1. The candidate must have completed forty-five hours of graduate work with an average grade of not less than "B," with no more than one-third of the grade "C."
2. The courses taken and passed must show a distribution based on the interests of the candidate and meet the requirements of the particular field of specialization as determined by the Faculty adviser. The distribution ordinarily would be fifteen hours chosen from related and/or supporting fields, fifteen hours of graduate music courses and fifteen hours of special problems and research in music.
3. The candidate must be in residence three Quarters or the equivalent.
4. The candidate must pass an oral comprehensive examination, and, in addition, present one of the following:
 - (a) A Thesis
 - (b) An original composition in one of the larger forms.

SUGGESTED COURSE REQUIREMENTS

1. For a Theory Major:
 - (a) Music—15 hours from the following group recommended according to the interest and preparation of the student: 632, 633, 665, 667, 761, 762, 763, 781.
 - (b) Minor problems—(650)—5 hours.
 - (c) Research in Music—(950)—10 hours.
 - (d) Elective—15 hours.
2. For a Composition Major:
 - (a) Music—15 hours from the following group recommended according to the interest and preparation of the students: 601, 603, 607, 632, 633, 643, 665, 709 A, B, C, D, E, F, 761, 762, 763, 781, 850.
 - (b) Minor problems—(650)—5 hours.
 - (c) Research in Music—(950)—10 hours.
 - (d) Elective—15 hours.
3. For a Major in Music Education (Vocal, Voice Pedagogy).
 - (a) Music—15 hours from the following group recommended according to the interest and preparation of the student: 682, 623, 624, 646, 656, 666, 667, 709B, 712, 713, 717, 721, 747, 748.
 - (b) Physics—645—3 hours.
 - (c) Minor problems—650—5 hours.
 - (d) Research in Music—950—10 hours.
 - (e) Elective—15 hours.
4. For a Major in Music Education (Instrumental, Instrumental Pedagogy).
 - (a) Music—15 hours from the following group recommended according to the interest and preparation of the student: 632, 633, 640, 641.
 - (b) Physics—645—3 hours.
 - (c) Minor Problems—650—5 hours.
 - (d) Research in Music—950—10 hours.
 - (e) Elective—15 hours.
5. For a Major in History and Literature of Music.
 - (a) Music—15 hours from the following groups recommended according to the interest and preparation of the student: 601, 603, 604, 605, 606, 608, 609, 610.
 - (b) Minor problems—650—5 hours.
 - (c) Research in Music—950—10 hours.
 - (d) Elective—15 hours.
6. For a Major in Psychology of Music.
 - (a) Music—3 hours as follows: 603, 607, 656.
 - (b) Psychology—667—3 hours.
 - (c) Music—Minor problems—650—5 hours.
 - (d) Elective—15 hours.
7. For a Major in Physics of Music.
 - (a) Physics—15 hours as follows: Modern Physics—640; Acoustics for students of Music—645; Advanced Physical Laboratory—616; Minor Problems in Physics—630.
 - (b) Music—15 hours from the following group recommended according to the interest and preparation of the students: 601, 603, 604, 605, 606, 607, 623, 624, 630, 631, 632, 640, 641, 643, 656, 661, 665, 667, 712, 713, 762, 763.
 - (c) Research in Music—950—10 hours.
 - (d) Elective—5 hours.
8. For a Major in Choral and Church Music.
 - (a) Music—15 hours from the following group recommended according to the interest and preparation of the student: 604, 605, 607, 609, 640, 670, 671, 721, 748, 850.
 - (b) Minor problems—650—5 hours.
 - (c) Research in Music—950—10 hours.
 - (d) Elective—15 hours.

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

*601. The Romanticists. Three credit hours. Autumn Quarter. Three lectures each week. General prerequisites must include fifteen hours of music theory or equivalent and a course in history and appreciation.

The music of the romantic period in Germany and France.

*602. The Opera of the Nineteenth Century. Three credit hours. Winter Quarter. Three lectures each week. General prerequisites must include fifteen hours of music theory or equivalent and a course in history and appreciation. Mr. Wilson.

* Not given in 1954-1955.

A short review of the history of opera; a study of the complete more important operas of the Nineteenth Century with the chief emphasis on the Wagnerian music dramas; and a consideration of the problems involved in a hybrid art.

603. Modern Music. Three credit hours. Winter Quarter. Three lectures each week. General prerequisites must include fifteen hours of music theory or equivalent and a course in history and appreciation. Mr. Wilson.

A brief survey of modern developments with special reference to the composers of France and Russia.

604. Organ Literature. Three credit hours. Spring Quarter. Three lectures each week. General prerequisites must include fifteen hours of music theory or equivalent and a course in history and appreciation. Mr. Held.

A comprehensive survey from the earliest compositions to the works of present-day composers.

***605. Choral Literature.** Three credit hours. Winter Quarter. Three lectures each week. General prerequisites must include fifteen hours of music theory or equivalent and a course in history and appreciation. Mr. Wilson.

Choral composers and literature with special consideration of the Sixteenth and Seventeenth Centuries.

***606. The Literature of Chamber Music.** Three credit hours. Spring Quarter. Three lectures each week. General prerequisites must include fifteen hours of music theory or equivalent and a course in history and appreciation. Mr. Wilson.

A survey of the chamber music of the classical and romantic periods with performance, analysis, and discussion.

607. The Classic Period. Three credit hours. Winter Quarter. Three lectures each week. General prerequisites must include fifteen hours of music theory or equivalent and a course in history and appreciation. Mr. Wilson.

A study of organ and other keyboard compositions and of chamber music and early orchestra writing in Germany, Italy, France, and England in the period 1650 to 1725.

***608. Music Literature of Latin America.** Three credit hours. Spring Quarter. Three lectures each week. General prerequisites must include fifteen hours of music theory or equivalent and a course in history and appreciation. Miss Dierker.

Designed to further an understanding of the cultural background of the peoples of Latin America through a study of their music. A brief survey of the origins and development of this music with emphasis on the contemporary period.

609. Mediaeval Modes. Three credit hours. Spring Quarter. Three recitations each week. General prerequisites must include fifteen hours of music theory or equivalent and a course in history and appreciation. Miss Kuehefuhs.

A study of the historical background and characteristics of Plainsong, including the technical aspects of notation, modes, rhythm and chironomy.

†622. Music Education in the Elementary School. Five credit hours. One Quarter. Autumn and Winter. Five recitations each week. Mr. Leeder, Mr. McBride, Miss Thomas.

Designed for teachers of music in the elementary schools. Special consideration will be given to the selection, presentation, and organization of material, and teaching procedures. Observation in the Elementary Schools.

Not open to students who have credit for Music 523.

†623. Music Literature for the Elementary School. Five credit hours. Winter Quarter. Five recitations each week. General prerequisites must include Music 622. Miss Thomas.

Designed to familiarize the student with art and folk music of various cultures for the listening and singing activities in the integrated curriculum of the elementary school.

† Not given during the academic year, 1954-1955.

* Not given in 1954-1955.

†624. Music Education in the Secondary Schools. Five credit hours. One Quarter. Autumn and Spring. Five recitations each week. General prerequisites must include Music 622. Mr. McBride.

A critical study of music, materials, and literature for use in the secondary schools and their presentation. Observation in secondary schools.

632. Orchestration. Three credit hours. Autumn Quarter. Three recitations each week. General prerequisites must include a course in instrumentation. Mr. Phelps.

Scoring for woodwind and brass instruments in various combinations and for wind band including an analysis of the scores and arrangements of Stravinsky, Winterbottom, Godfrey, Leidzen, Cailliet and Gould. Attendance at a number of rehearsals and concerts of symphonic bands will be required.

*633. Orchestration. Three credit hours. Autumn Quarter. Three recitations each week. General prerequisites must include a course in instrumentation. Open only to students in Curriculum V majoring in composition and/or theory. Mr. Phelps.

Continued practice in scoring for orchestras of various sizes. Analysis of orchestral scores of Wagner, Debussy, Stravinsky and others. Attendance at a number of rehearsals and concerts of symphony orchestras will be required.

†641. Instrumental Music Education. Five credit hours. Winter Quarter. Five recitations each week. General prerequisites must include Music 622.

Organization and administration of instrumental music as it functions in the secondary school. Special consideration will be given to the school orchestra, concert band, marching band, small ensembles. Observation in the secondary schools.

643. Advanced Conducting (Instrumental). Three credit hours. Spring Quarter. Three classes each week. General prerequisites must include a course in instrumentation. Mr. McGinnis.

This course aims to develop the power to interpret the larger forms of instrumental literature and to read from full score.

Open only to students demonstrating advanced capacities in musicianship and technical skills in conducting.

646. Advanced Conducting (Vocal). Three credit hours. Autumn Quarter. Three classes each week. Mr. Gilliland.

This course aims to develop the power to interpret the larger forms of choral literature and to read from full score.

Open only to students demonstrating advanced capacities in musicianship and technical skills in conducting.

650. Minor Problems. One to five credit hours. All Quarters. In addition to the general prerequisites, the permission of the instructor must be obtained. Graduate staff.

Investigation of minor problems in the field of music.

(f) Service playing (organ)

(g) Church Music

(m) Teaching Theory

(n) Contrapuntal Techniques

(o) Arranging

(p) Analysis

656. Principles of Music Learning. Three credit hours. Autumn Quarter. Three recitations each week. General prerequisites must include permission of the instructor. Mr. Wilson.

An analysis of the factors in learning to appreciate and perform music in early childhood and through adult life.

*665. Advanced Harmonic Analysis. Three credit hours. Winter Quarter. Three recitations each week. Miss Kuehefuhs.

* Not given in 1954-1955.

† Not given during the academic year, 1954-1955.

A study of representative compositions of various periods, with emphasis on formal, harmonic and stylistic analysis. The course is designed to provide the student with an analytic technique applicable to the music of any period.

***666. Teaching of Theory.** Three credit hours. Winter Quarter. Three recitations each week. Miss Kuehefuhs.

Basic principles and problems in the teaching of correlated music theory. Special emphasis on theory instruction in secondary schools.

667. Advanced Keyboard Harmony. Three credit hours. Winter Quarter. Three recitations each week. Mr. Vedder.

Intensive practice in playing at the keyboard material learned previously. Modulation by common tone and by common chord, chromatic modulation, figured bass, harmonization of melodies at sight, transposition, improvisation.

670. Music in the Church. Three credit hours. Winter Quarter. Three recitations or lectures each week. General prerequisites must include at least 45 Quarter hours of music courses. Mr. Diercks.

A consideration of the forms of worship and symbols found in the church. A study of traditional and modern trends in all forms of worship with special emphasis on the ties between music, other arts, and the litany of the service. A study of the history of hymns.

671. Technics and Materials for Church Choirs. Five credit hours. Autumn Quarter. Five recitations each week. General prerequisites must include at least forty-five hours of music courses. Mr. Diercks.

A study of methods and materials for church choirs. The study of practical problems of mounting a church service, chanting, processional, etc., with consideration for anthem selection and performance, with observation of choirs.

Not open to students who have credit for Music 772.

709. Applied Music. Three credit hours. All Quarters. General prerequisites must include graduate standing in Music and placement examination.

Open to other qualified students within the limits of instructional facilities by permission of the School of Music. Mr. Weigel.

A minimum of three Quarters' study must be completed to secure credit. A progress grade will not be recorded until the requirement is satisfied.

(Section) A. (Piano) Miss Hardy, Miss Jones.

(Section) B. (Voice) Mr. Gilliland, Mr. Diercks.

(Section) C. (Strings) Mr. Hardesty, Mr. McClure.

(Section) D. (Woodwinds) Mr. McGinnis, Mr. Poland.

(Section) E. (Brass) Mr. Evans, Mr. Stoll.

(Section) F. (Organ) Mr. Held.

The study of Applied Music at Graduate level. A highly specialized and intense study of Applied Music Literature and the techniques of performance.

The Music Literature to be studied and the proficiency levels to be attained for each Division will be determined by the instructor.

†712. Supervision of Music in the Elementary Schools. Three credit hours. Three recitations each week. Open to graduate students majoring in music. Mr. Leeder.

A study of the specific problems of music supervision with special attention given to curriculum construction in the elementary schools.

Not open to students who have credit for Music 612.

†713. Supervision of Music in Secondary Schools. Three credit hours. Open to graduate students majoring in music. Mr. Leeder.

This course is designed to study evaluation criteria and the problems of the music supervisor in the secondary schools.

Not open to students who have credit for Music 613.

* Not given in 1954-1955.

† Not given during the academic year, 1954-1955.

†717. **Song Literature.** Three credit hours. Three periods each week. General prerequisites must include six Quarters of voice or the equivalent. Mr. Gilliland.

The study of song literature selected to meet the needs of the student, artist, or teacher; functions of the types of songs; program building.

†720. **Piano Pedagogy.** Three credit hours. Summer Quarter. Six class lectures each week. General prerequisites must include a minimum of six Quarter hours of applied study in piano and graduate standing in music.

An analysis of the principles and practices current in the teaching of piano. This course is designed for graduate students who have had experience in teaching or for students who have had a background of experience enabling them to comprehend advanced materials, together with experimental and advanced methods of procedure and principles of teaching.

†721. **Vocal Pedagogy.** Three credit hours. General prerequisites must include a minimum of six Quarter hours of applied study in voice and graduate standing in music.

An analysis of the principles and practices current in the teaching of voice.

This course is designed for graduate students who have had experience in teaching or for students who have had a background of experience enabling them to comprehend advanced materials, together with experimental and advanced methods of procedure and principles of teaching.

†722. **String Instrument Pedagogy.** Three credit hours. General prerequisites must include a minimum of six Quarter hours of applied study in string instruments and graduate standing in music.

An analysis of the principles and practices current in the teaching of strings.

This course is designed for graduate students who have had experience in teaching or for students who have had a background of experience enabling them to comprehend advanced materials, together with experimental and advanced methods of procedure and principles of teaching.

†723. **Woodwind Instrument Pedagogy.** Three credit hours. General prerequisites must include a minimum of six Quarter hours of applied study in the woodwind family and graduate standing in music. Mr. McGinnis.

An analysis of the principles and practices current in the teaching of woodwinds.

This course is designed for graduate students who have had experience in teaching or for students who have had a background of experience enabling them to comprehend advanced materials, together with experimental and advanced methods of procedure and principles of teaching.

†724. **Brass Instrument Pedagogy.** Three credit hours. Six lectures each week. Prerequisite, a minimum of six Quarter hours of applied study in brass instruments and graduate standing in music. Mr. Evans.

An analysis of the principles and practices current in the teaching of brass instruments.

This course is designed for graduate students who have had a background of experience enabling them to comprehend advanced materials, together with experimental and advanced methods of procedure and principles of teaching.

747. **Problems in Vocal Music Education.** One to five credit hours. This course may be repeated to a maximum of ten hours. All Quarters. General prerequisites must include permission of the instructor. Graduate staff.

Study of the problems encountered in the teaching and supervising of music. Additional investigation of the course of study, special programs, the integrated course, etc.

Not open to students who have credit for Music 647.

748. **Choral Problems.** One to five credit hours. All Quarters. General prerequisites must include permission of the instructor. This course may be repeated to a maximum credit of ten hours. Graduate staff.

Study of the problems encountered in developing choruses and church choirs. A full chorus and church choir will be available for observation.

Not open to students with credit for Music 648 and 748 if credit totals more than ten hours.

749. **Problems in Instrumental Music Education.** One to five credit hours.

† Not given during the academic year, 1954-1955.

All Quarters. Lectures, observations, and special problems. General prerequisites must include permission of the instructor. This course may be repeated to a maximum of ten hours. Graduate staff.

Study of problems encountered in teaching, supervision, and organization of the instrumental music program. A full orchestra or band will be available for observation.

Not open to students who have credit for Music 644.

761. Counterpoint. Three credit hours. Autumn Quarter. Three recitations each week. General prerequisites must include a fundamental course in counterpoint. Miss Kuehefuhs.

A study of modal counterpoint based on the vocal polyphonic style of the Sixteenth Century. Analysis of representative works; practice in two, three and four part work, leading to the writing of motets.

762. Counterpoint. Three credit hours. Winter Quarter. Three recitations each week. Miss Kuehefuhs.

Counterpoint in two parts, based on the contrapuntal practices of the Eighteenth Century. Writing of two-part inventions. Some work in three-part counterpoint.

***763. Fugue.** Three credit hours. Spring Quarter. Three recitations each week. General prerequisites must include Music 762. Mr. Phelps.

A detailed study of the fugue, and writing of three and four voice fugues. A brief survey of chorale figuration and other contrapuntal forms.

781. Composition. Three credit hours. One Quarter. Autumn and Spring. Three recitations each week. General prerequisites must include a beginning course in creative writing. Mr. Phelps.

Opportunity for, and guidance in, creative writing. The course includes analysis and discussion of devices used in contemporary music, and the student is expected to acquire a working knowledge of these materials.

This course may be repeated to a maximum of nine Quarter hours.

Not open to students who have credit for Music 782 and 783.

NOTE: For course in Acoustics for Students of Music, see the Department of Physics, Course 645.

For course in the Psychology of Music, see the Department of Psychology, Course 667.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

850. Seminar in Music. One to five credit hours. All Quarters. General prerequisites must include graduate standing and consent of instructor. Graduate staff.

950. Research in Music. All Quarters. Graduate Staff.

Original investigation in a field of specialization. Research and study leading to the Master of Arts degree.

NOTE: For course in the Preparation of Theses, see the Department of Education, Course 802.

NURSING

Office, B-201, Starling-Loving Hospital

PROFESSOR NEWTON, ASSOCIATE PROFESSORS CHAMBERS, LEWIS, AND PEASE

Prerequisites for Graduate Work. In addition to the requirements of the Graduate School found elsewhere in the bulletin, the student must have:

1. A baccalaureate degree with a major in nursing from a college or university of approved standing. This major in nursing must be comparable to that offered by The Ohio State University and include courses and experiences in medical, surgical, maternity, pediatrics, psychiatric, communicable diseases, and public health nursing. Students who do not have the above requirements must complete such deficiencies in addition to graduate degree requirements.
2. Satisfactory professional nursing experience.

* Not given in 1964-1965.

Areas of Specialization within the Department for the Degree Master of Science:

Students may prepare themselves to teach medical-surgical nursing or to teach psychiatric nursing.

Requirements for the Degree Master of Science:

1. **Course of Study.** Not later than the end of the first Quarter of residence the candidate after consultation with her adviser shall submit her program of study to the departmental Committee on Graduate Work. The program shall not be rigidly fixed but planned to meet the needs and interest of the individual student.
2. **Thesis.** Not later than two Quarters before the time at which the candidate expects to receive the Master's degree she must select the subject of the thesis. This is done in conference with the departmental Committee on Graduate Work.

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

602. Public Health Nursing and Health Service in the Family. Five credit hours. One Quarter. Autumn, Winter, Spring. Five class meetings each week. Miss Leazenbee.

A study of the history, development, and trends in Public Health Nursing together with a critical evaluation of the aims, objectives, and underlying principles involved.

701. Minor Problems in Nursing. One to five credit hours. Autumn, Winter, and Spring Quarters. One conference or more each week. General prerequisites must include at least four credit hours for Nursing 746 and the consent of the adviser. The Graduate staff.

Reading conferences and minor investigations by individual arrangement for qualified students who desire to study a particular nursing problem more intensively than is possible in other courses.

736-737. Interpersonal Aspects of Nursing. Three credit hours each Quarter. 736, Autumn Quarter; 737, Winter Quarter. Must be taken in sequence. Nursing 736 is prerequisite to 737. Miss Lewis and staff.

The influence of modern psychiatry on nursing practice. Emphasis given to nursing as a significant interpersonal process. Students do independent study and participate in conferences and seminars.

740-741. Advanced Medical-Surgical Nursing. Three credit hours each Quarter. 740, Autumn Quarter; 741, Winter Quarter. Must be taken in sequence. Nursing 740 is prerequisite to 741. Miss Chambers and staff.

Intensive study of selected medical-surgical nursing problems. Students do independent study and participate in conferences and seminars.

746. Field Instructions. Four to fifteen credit hours. Autumn, Winter, and Spring Quarters. The first Quarter of registration in this course must be for four credit hours. A weekly average of four hours of selected clinical experience per credit hour and two class meetings a week are required. Each field placement must be arranged in consultation with the student's adviser. Miss Chambers, Miss Lewis, and staff.

Application of the scientific method of study to selected nursing and teaching problems. The methods of instruction will include observation and participation in the clinical situation, individual and group conferences, library study, field trips, and written reports.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

802. Research Development in Nursing. Three credit hours. Autumn Quarter. Miss Newton.

A seminar on the status and scope of research in nursing. Written reports, and comparison of various types of research studies will be required.

810. Curriculum Development. Five credit hours. Winter Quarter. General prerequisites must include Nursing 646 or equivalent, and four credit hours of Nursing 746. Mrs. Pease.

A study of the theories of higher education as they relate to education for nursing and the principles of curriculum development. Students have an opportunity to apply these principles to the study of program planning in nursing.

950. Research in Nursing. Credit to be arranged. Autumn, Winter, and Spring Quarters. General prerequisites must include Nursing 802 and the consent of the departmental chairman. Weekly conferences and reports. Miss Newton and the Graduate staff.

This course is to be used for the Master's thesis.

OBSTETRICS AND GYNECOLOGY

Office, University Hospital

PROFESSOR HOLLENBECK AND STAFF

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

780. Minor Problems. Two to five credit hours. All Quarters. Prerequisite, adequate preclinical training and permission of instructor required. Dr. Hollenbeck and staff.

Clinical, laboratory, conference, and library work in Obstetrics and/or Gynecology.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

900. Obstetrical and Gynecological Pathology. Two to five credit hours. All Quarters. Permission of instructor required. Dr. Meiling and Dr. Holzappel.

Laboratory, conference, and library work. Study of current pathological specimens with emphasis upon special investigation.

950. Obstetrical and Gynecological Research. All Quarters. General prerequisites must include adequate preclinical training and permission of instructor required. The student is required to spend part of his time in research work and must be registered in The Graduate School. Dr. Hollenbeck and staff.

Clinical, laboratory, conference, and investigative work in Obstetrics and/or Gynecology.

OPTOMETRY

PHYSIOLOGICAL OPTICS

Office, 107 Optometry Building

PROFESSOR FRY, ASSISTANT PROFESSORS KNOX, ELLERBROCK, AND ALLEN

Prerequisites for Graduate Work: Graduate work in Physiological Optics presupposes the completion of satisfactory undergraduate work in Mathematics, including Differential and Integral Calculus, Physics, Zoology, Anatomy, Physiology, Psychology, and Physiological Optics. If the requirements are not met by the time of admission, any deficiencies must be made up in excess of the regular requirements for a degree.

Requirements for the Master's Degree: Each Quarter prior to registration, the candidate for the Master's Degree must plan his program with the professor in charge of graduate study in Physiological Optics. The program of work leading to the Master's Degree is not rigidly fixed. Work in other departments may be recommended according to the needs of the individual student. Not later than two Quarters before the time in which the candidate expects to receive the Master's Degree, he must, after a conference with the professor in charge, select the subject of his thesis and the instructor with whom he elects to work. A reading knowledge of German is highly desirable but not a fixed requirement.

Requirements for the Doctor of Philosophy Degree: The courses of study to be pursued for the Doctor's Degree are arranged for each student by the Committee on Graduate Study in Physiological Optics after consultation with the student and his adviser.

- (a) All candidates for the Doctor's degree in Physiological Optics must acquire a reading knowledge of both French and German. Students are advised to meet this requirement as early as possible.

- (b) Not later than four Quarters before the student expects to receive the Ph.D. Degree, he must, after a conference with the professor in charge of graduate study in Physiological Optics, select the field of his dissertation and the instructor under whose direction he elects to work.
- (c) Before being admitted to candidacy for the Doctor's Degree, the applicant is required to pass a written examination on Physiological Optics, Physical Optics, Anatomy of the Eye and Nervous System, Physiology of Vision, and Psychology of Vision. These written examinations are followed by an oral examination as required by the Graduate School.

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

611. Introduction to Physiological Optics. Five credit hours. Autumn Quarter. Four lectures and recitations and one two-hour laboratory period each week. General prerequisites must include a course in anatomy and geometrical and physical optics. Mr. Knox.

The eye as an optical instrument; the refracting mechanism; the mechanism of accommodation and pupillary contraction; myopia, hyperopia and astigmatism; diffraction and aberrations affecting blurredness of the retinal image; stray light in the eye; illumination in the retinal image; absorption of the ocular media; shape, size, and distortions of the retinal image; entoptic phenomena.

Not available for graduate credit for students majoring in Physiological Optics.

Not open to students who have received credit for Optometry 511.

612. Introduction to Physiological Optics. Five credit hours. Winter Quarter. Four lectures and recitations and one two-hour laboratory period each week. General prerequisites must include Physiological Optics 611. Mr. Knox.

The motility of the eye; the structure and innervation of the extra-ocular muscles; the center of rotation and analysis and description of eye movements; tonicity of the extra-ocular muscles; fixational movements; fusional movements; relation of convergence to pupil contraction and accommodation.

Not available for graduate credit for students majoring in Physiological Optics.

Not open to students who have received credit for Optometry 512.

613. Intermediate Physiological Optics. Five credit hours. Spring Quarter. Four lectures and recitations and one two-hour laboratory period each week. General prerequisites must include Physiological Optics 612. Mr. Knox.

Monocular sensory mechanisms of vision; analysis and specification of visual stimuli; photoreception and retino-cortical transmission; adaptation of photoreceptors; flicker; brightness discrimination; and color-vision.

Not open to students who have received credit for Optometry 513.

614. Intermediate Physiological Optics. Three credit hours. Spring Quarter. Three lectures each week. General prerequisites must include Physiological Optics 612.

Circulation and metabolism of the eye; intra-ocular pressure; lacrimal system; movements and functions of the eyelids.

615. Intermediate Physiological Optics. Five credit hours. Autumn Quarter. Four lectures and recitations and one two-hour laboratory each week. General prerequisites must include Physiological Optics 613.

Binocular integration of hue and brightness; retinal correspondence; visual perception of figure-ground relations, light, color, illumination, size, shape, direction, distance, and motion.

701. Minor Problems in Physiological Optics. One to fifteen credit hours. Any Quarter. Conference, library and laboratory work. General prerequisites must include satisfactory advanced courses in physiological optics and permission of the instructor. A student may repeat this course and spend all or any part of his time on it during a Quarter. All instructors.

This course is designed to permit any properly qualified student to avail himself of the library facilities of the department for carrying out a minor investigation or for adding to

his knowledge and technique in some branch of physiological optics. Students who have specialized interests in some field of physiological optics may elect this course to secure an opportunity for *independent reading and study* under the supervision of an instructor.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

801. Advanced Physiological Optics. Five credit hours. Autumn Quarter. Three lectures and two two-hour laboratory periods each week. General prerequisites must include Physiological Optics 613 and two Quarters of Calculus. Mr. Fry.

The image-forming mechanism of the eye; the mechanism of accommodation and pupillary contraction; aberrations, stray light; entoptic phenomena; shape, size, distortions, intensity and blurredness of the retinal image.

802. Advanced Physiological Optics. Five credit hours. Winter Quarter. Three lectures and two two-hour laboratory periods each week. General prerequisites must include Physiological Optics 801. Mr. Fry.

Methods of controlling and measuring the accuracy of fixation; analysis and specification of visual stimuli; photoreceptor mechanisms of light and color vision including photochemistry and electrophysiology of the photoreceptors; luminosity of spectral colors; chromatic photometry; interpretation of color-mixture data; determination and specification of chromaticity; retino-cortical transmission; simultaneous contrast and induction; visibility of lens, points and borders; responses to momentary, intermittent, and moving stimuli; adaptation phenomena; after-images.

803. Advanced Physiological Optics. Five credit hours. Spring Quarter. Three lectures and two two-hour laboratory periods each week. General prerequisites must include Physiological Optics 802. Mr. Fry.

Fusional movements and maintenance of binocular fixation; binocular integration of hue and brilliance; retinal correspondence; visual perception of figure ground relations, light, color, illumination, size, shape, direction, distance, motion, and complex patterns of stimuli.

950. Research in Physiological Optics. Autumn, Winter, and Spring Quarters. Library conference and laboratory work. General prerequisites include acceptable courses in physiological optics, physics, and mathematics. The subject of research must be chosen after consultation with the professor in charge of graduate work in Physiological Optics. The course may be repeated as often as desired. It is intended primarily to meet the needs of students who must complete either a thesis or a dissertation as part of the requirements for a degree. Mr. Fry.

PATHOLOGY

Office, M-112 Starling-Loving Hospital

PROFESSORS von HAAM, DAVIDSON, REINHART, SCHLUMBERGER AND SHINOWARA,
ASSOCIATE PROFESSOR TOWBIN

Prerequisites for Graduate Work: Graduate work in *pathologic anatomy* is offered to students who are in possession of an M.D. degree or students in the College of Medicine of The Ohio State University. Students desiring to register during the Summer Quarter must have been registered previously in the College of Medicine of The Ohio State University or some other first grade school of medicine. The prerequisites for major graduate work in *pathologic anatomy* for students not in possession of an M.D. degree include the successful completion of the freshman schedule of the College of Medicine or its equivalent and passing of Pathology 624 (Principles of Pathology) or its equivalent with not less than B standing.

For students majoring in some other science and desiring courses in *pathologic anatomy*, permission must be obtained in every specific case from the chairman of the department.

For both the Master's degree and the Ph.D. degree in *pathologic anatomy* a thorough training in autopsy technic and surgical pathology is required in addition to the successful completion of course work and the required thesis or dissertation. Such training is obtained in one of the hospital laboratories affiliated with the Department of Pathology.

Graduate work in *clinical pathology* is offered to students who are in possession of a B.A. or B.S. degree from any recognized college of the United States. The prerequisites for major graduate work in *clinical pathology* are a major in chemistry or bacteriology and courses equivalent to the requirements for the fourth year of the curriculum in Medical Technology.

In order to obtain a Master's or Ph.D. degree in *clinical pathology* a thorough practical

training in all laboratory work as performed in the various hospital laboratories is required. In addition to the regular course work and required thesis or dissertation the candidate must spend one year in the laboratory of a hospital affiliated with the Department of Pathology and must be able to qualify for certification by the Board of Medical Technologists.

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

Courses 603, 604, 624, 625, 626, 700, 780, 761, 753, 756, 758, 759, 761, and 780 are open only to students who are doubly registered in the College of Medicine and the Graduate School to the extent of fifteen Quarter hours.

603. Clinical Pathology. Three credit hours. Winter Quarter. Two lectures and four laboratory hours each week. General prerequisites must include Bacteriology 641-642 and Physiological Chemistry 601-602. Mr. Reinhart and Mr. Shinowara.

A study of unstained and stained blood specimens; special blood pathology; blood typing and matching. Animal parasites and ova. Examination of feces. Special parasites of blood and tissues.

604. Clinical Pathology. Three credit hours. Spring Quarter. Two lecture and four laboratory hours each week. General prerequisites must include Bacteriology 641-642 and Physiological Chemistry 601-602. Mr. Reinhart and Mr. Shinowara.

Urinalysis. Blood chemistry and functional tests. Study of sputum, spinal fluid, gastric contents, blood cultures and sero-diagnostic methods.

624. Pathology. Five credit hours. Autumn Quarter. Three lectures and six laboratory hours each week. Mr. von Haam, Mr. Schlumberger and assistants.

A detailed study of degenerative, circulatory, inflammatory, and neoplastic lesions; reactions to injury.

Not open to students who have credit for Pathology 627.

625. Pathology. Five credit hours. Winter Quarter. Three lectures and six laboratory hours each week. Mr. von Haam, Mr. Dick and assistants.

Pathology of infectious diseases; pathology of the circulatory, respiratory, and hemopoietic systems.

Not open to students who have credit for Pathology 628.

626. Pathology. Five credit hours. Spring Quarter. Three lectures and six laboratory hours each week. Mr. Schlumberger, Mr. Davidson, Mr. Towbin and assistants.

Pathology of the gastro-intestinal, urinary, reproductive, endocrine, nervous, and skeletal systems.

Not open to students who have credit for Pathology 670.

653-654. Clinical Pathology. Three credit hours. 653, Winter Quarter; 654, Spring Quarter. Two lectures and four laboratory hours each week. General prerequisites must include acceptable courses in bacteriology and chemistry. Mr. Reinhart, Mr. Shinowara and staff.

A study of the changes in the blood, secretions, serums, and exudates of the body brought about by disease.

661. Pathology. Five credit hours. Autumn Quarter. Three lectures and six laboratory hours each week. Mr. von Haam, Mr. Schlumberger and assistants.

A detailed study of degenerative, circulatory, inflammatory, and neoplastic lesions; reactions to injury.

Not open to students who have credit for Pathology 664.

662. Pathology. Five credit hours. Winter Quarter. Three lectures and six laboratory hours each week. Mr. von Haam, Mr. Dick and assistants.

Pathology of infectious diseases; pathology of the circulatory, respiratory, and hemopoietic systems.

Not open to students who have credit for Pathology 665.

663. Pathology. Five credit hours. Spring Quarter. Three lectures and six laboratory hours each week. Mr. Schlumberger, Mr. Davidson, Mr. Towbin and assistants.

Pathology of the gastro-intestinal, urinary, reproductive, endocrine, nervous and skeletal systems.

Not open to students who have credit for Pathology 666.

700. Autopsy Technique. One credit hour. All Quarters. General prerequisites must include Pathology 626. Mr. Towbin.

This course will be conducted in the form of clinico-pathological conferences held in conjunction with an autopsy or fresh tissue demonstration.

730. Clinico-pathological Conferences. One credit hour. Autumn, Winter, and Spring Quarters. One conference each week. The staff.

A clinical pathological conference correlating the symptomatology of the most important internal and surgical diseases with organ pathology.

750. Minor Problems. Two to five credit hours. All Quarters. General prerequisites must include accepted courses in pre-medical sciences and permission of the instructor. The staff.

Minor problems in clinical or special pathology.

751. Medico-legal Pathology. One credit hour. Autumn, Winter, and Spring Quarters. One lecture hour each week. Mr. von Haam.

A course discussing the pathology of trauma, homicide, sex offenses, and intoxications with special reference to the medico-legal aspects.

753. Neuropathology. One credit hour. Autumn, Winter, and Spring Quarter. One hour lecture each week. Mr. Towbin.

A detailed study of lesions of the central nervous system with special reference to the neurological symptoms encountered.

756. Biopsy Diagnosis. One credit hour. Autumn, Winter and Spring Quarters. One hour demonstration each week. Mr. Schlumberger.

A study of the methods of rapid tissue diagnosis including frozen tissue section, punch biopsy, and aspiration biopsy. Limited to eight students.

758. Pathology of Tropical Diseases. One credit hour. Autumn, Winter and Spring Quarters. One hour lecture each week. Mr. Reinhart.

A discussion of the pathology of diseases encountered in tropical and subtropical countries.

Not open to students who have credit for Pathology 739.

759. Geriatrics. One credit hour. Autumn, Winter, and Spring Quarters. One hour lecture-demonstration each week. Mr. von Haam.

A study of the pathologic conditions found commonly in old age.

761. Pediatric Pathology. One credit hour. Autumn, Winter, and Spring Quarters. One hour lecture each week. Mr. Newton.

Study of the lesions most commonly found in early childhood.

Open to students registered in the College of Medicine.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

800. Seminar in Pathology. Two credit hours. All Quarters. Required of all graduate students majoring in pathology. The staff.

Discussion of pertinent literature and demonstration of fresh specimens and slides.

950. Research in Pathology. Autumn, Winter, Spring, and Summer Quarters. General prerequisites must include accepted courses in basic pre-clinical sciences. Mr. von Haam and staff.

PEDIATRICS

Office, Children's Hospital

PROFESSOR BAXTER AND STAFF

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

780. Minor Problems. One to five credit hours. All Quarters. Library, conference, clinic, and laboratory work. General prerequisites must include adequate preclinical training and permission of the instructor. Mr. Baxter and staff.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

900. Seminar. Three to five credit hours. Autumn, Winter, and Spring Quarters. Students are responsible for the material presented at these seminars at least twice a year. Attendance at weekly Grand Rounds on the pediatric service, as well as weekly attendance of X-ray and surgical pathological conferences is required. Permission of the director of the department is required.

950. Research in Pediatrics. All Quarters. Library, conference, clinical, and laboratory work. General prerequisites must include an acceptable pediatric background and proof of interest in and ability to undertake investigative work. Permission of instructor and registration in the Graduate School are required. An opportunity is offered for investigation of problems in hematology, nutrition, Rh factor, school health, general pediatrics.

PHARMACY

Office, 104 Pharmacy and Bacteriology Building

PROFESSORS CHRISTENSEN, GUTH, HARRIS, AND NELSON, ASSOCIATE PROFESSOR BOPE, ASSISTANT PROFESSORS TYE, BELCASTRO, WILLIAMS, AND BEAL

Prerequisites for Graduate Work: The student must have graduated from an accredited college of pharmacy whose entrance and graduation requirements are equivalent to those in effect for the College of Pharmacy of The Ohio State University.

Requirements for the Degree Master of Science:

(a) *Courses of Study.* Not later than the first Quarter of residence the candidate shall submit to the Graduate Committee in Pharmacy his program of study. It must show the subject of the proposed thesis, and the courses to be undertaken in the field of specialization and in related fields.

(b) *Thesis.* A thesis embodying the results of independent investigations and of sufficient importance to justify publication in a technical journal is required. It is expected that about one-third of the time of the student should be devoted to research.

(c) *Examinations.* Examinations either oral or written or both covering the field of specialization, allied fields, and the thesis are conducted by an examining committee as a concluding basis for determining whether or not the candidate is recommended for the degree.

Requirements for the Degree Doctor of Philosophy:

(a) *Advisory Committee.* Graduate programs for this degree are under the general supervision of an advisory committee consisting of members of the staff of the College of Pharmacy and representatives from cognate departments.

(b) *Courses of Study.* Not later than the fourth Quarter of residence the candidate shall submit to the advisory committee in Pharmacy his program of study. It must show the subject of the proposed dissertation, and the courses to be taken in the field of specialization and in two cognate fields.

(c) *Field of Specialization.* The special field of study may be elected from any of the four subdivisions of Pharmacy, namely, Pharmaceutical Chemistry, Pharmacognosy, Pharmacology, or Pharmacy.

(d) *Examinations.* The general examinations for admission to candidacy for the degree are conducted by a committee appointed by the Dean of the Graduate School, upon written request of the student's adviser (who acts as chairman). This committee must include at least one representative from each of the departments in which the student is taking his cognate studies. When the student's adviser decides that the student is ready for the general examinations he will so notify the office of the Graduate School in writing. The general examinations shall be both written and oral.

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

601. Glandular Products. Five credit hours. Autumn Quarter. Five lectures and recitations each week. Mr. Nelson, Mr. Tye.

Preparation, properties, standardization and uses of medicinal products obtained from organs and glands of animals.

602. Biological Products. Three credit hours. Spring Quarter. Three lectures and recitations each week. General prerequisites must include Bacteriology 607. Mr. Nelson, Mr. Tye.

U.S.P. standards and legal requirements governing manufacture, standardization, storage, and distribution of toxins, antitoxins, serums and vaccines.

605. Organic Pharmacy. Five credit hours. Spring Quarter. Three lectures and two three-hour laboratory periods each week. Mr. Harris, Mr. Bope, Mr. Williams.

A continuation of Pharmacy 604. More attention is given to the synthesis of important type chemotherapeutic agents.

708-709. Materia Medica. Five credit hours each Quarter. 708, Autumn and Winter; 709, Winter and Spring. Four lectures and one three-hour laboratory period each week. Mr. Nelson, Mr. Tye.

Lecture, recitation, and laboratory courses covering the fundamental facts in *Materia Medica* and including a discussion of the more commonly used drugs and preparations with a brief discussion of their pharmacology and therapeutic applications.

711. Drug Assays. Five credit hours. One Quarter. Autumn and Winter. Three lectures and two three-hour laboratory periods each week. Mr. Harris, Mr. Bope, Mr. Williams.

A continuation of Pharmacy 610. Primarily a study of the assays in the *Pharmacopoeia* and *National Formulary*.

712. Pharmaceutical Analysis. Five credit hours. One Quarter. Winter and Spring. Two lectures, one recitation, and two three-hour laboratory periods each week. General prerequisites must include Pharmacy 711 or its equivalent. Mr. Harris, Mr. Bope.

The use of specialized instruments in the assay and control methods of drugs and drug preparations.

714. Materia Medica of Newer Products. Three credit hours. One Quarter. Winter and Spring. Three lectures each week. General prerequisites must include Pharmacy 709. Mr. Nelson, Mr. Tye.

A lecture and recitation course covering the pharmacology of the most recent drugs and preparations and their therapeutic applications.

717. Microscopical Pharmacognosy. Three credit hours. Autumn Quarter. One lecture and two two-hour laboratory periods each week. Mr. Beal, Mr. Tye.

A continuation of Pharmacy 616, with special emphasis upon the application of the microscope in the identification of crude drugs, spices, food products, etc., and their adulterants.

718. Microscopical Pharmacognosy. Three credit hours. One Quarter. Autumn, Winter, Spring. One lecture and recitation and two two-hour laboratory periods each week. Mr. Christensen, Mr. Beal.

The application of microchemical tests in the identification of cell inclusions and plant constituents such as organic acids, organic salts and alkaloids.

722. Advanced Techniques. Four credit hours. One Quarter. Winter and Spring. Two lectures and two three-hour laboratory periods each week. General prerequisites must include Pharmacy 604. Mr. Guth, Mr. Belcastro.

A course dealing with the more complex techniques and processes of operative pharmacy.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

800. Minor Problems in Pharmacognosy. One to five credit hours each Quarter. Autumn, Winter, Spring. General prerequisites must include satisfactory courses in the field of pharmacognosy. Mr. Christensen, Mr. Beal.

Conference, library, and laboratory work.

A student may obtain a maximum of fifteen credit hours in the course.

801. Minor Problems in Pharmaceutical Chemistry. One to five credit hours each Quarter. Autumn, Winter, Spring. Mr. Harris, Mr. Bope.

Conference, library, and laboratory work.

A student may obtain a maximum of fifteen credit hours in the course.

802. Minor Problems in Pharmacy. One to five credit hours each Quarter. Autumn, Winter, Spring. Mr. Guth, Mr. Belcastro.

Conference, library, and laboratory work.

A student may obtain a maximum of fifteen hours in the course.

803. Minor Problems in Materia Medica. One to five credit hours each Quarter. Autumn, Winter, Spring. General prerequisites must include satisfactory courses in the field of pharmacy. Mr. Nelson, Mr. Tye.

Conference, library, and laboratory work.

A student may obtain a maximum of fifteen hours in the course.

805. Technology. Three to six credit hours each Quarter. Autumn, Winter, Spring. General prerequisites must include nine credit hours of Pharmacy 802 or its equivalent, and permission of the instructor. Conference, library, and laboratory work.

The student may obtain a maximum of eighteen credit hours in any one of the following special fields, but not more than twenty-four hours in the course.

(a) Problems in the manufacture of pharmaceutical preparations. Mr. Guth.

(b) Technological theories and principles with industrial applications. Mr. Guth.

810. Problems on Drug Standardization. Three to six credit hours each Quarter. Autumn, Winter and Spring. General prerequisites and permission of the instructor. Conference, library, and laboratory work.

The student may obtain a maximum of eighteen credit hours in any one of the following special fields, but not more than twenty-four hours in the course.

(a) Biological methods. Mr. Nelson, Mr. Tye.

(b) Chemical methods. Mr. Harris, Mr. Bope.

816. Special Problems in Pharmacognosy. Three to six credit hours each Quarter. Autumn, Winter, Spring. General prerequisites and permission of the instructor. Conference, library, laboratory, and field work.

The student may obtain a maximum of eighteen credit hours in any one of the following special fields, but not more than twenty-four hours in the course.

(a) Macro- and micro-analysis of medicinal plants. Mr. Christensen, Mr. Beal.

(b) Chemical methods. Mr. Harris, Mr. Bope.

820. Special Problems in Pharmaceutical Chemistry. Three to six credit hours each Quarter. Autumn, Winter, Spring. General prerequisites and permission of the instructor. Conference, library, and laboratory work.

The student may obtain a maximum of eighteen credit hours in any one of the following special fields, but not more than twenty-four hours in the course.

(a) Synthetic organic medicinals. Mr. Harris, Mr. Bope.

(b) Chemistry of plant drug constituents. Mr. Harris, Mr. Bope.

(c) Advanced drug analysis. Mr. Harris, Mr. Bope.

850. Seminar. One to four credit hours. Autumn, Winter, and Spring Quarters. Mr. Christensen, Mr. Guth, Mr. Nelson, Mr. Bope, Mr. Tye, Mr. Harris.

Round table discussions, oral and written reports dealing with recent advances in pharmacy.

950. Research. Autumn, Winter, and Spring Quarters. Mr. Christensen, Mr. Guth, Mr. Harris, Mr. Nelson, Mr. Bope, Mr. Tye.

PHILOSOPHY

Office, 10 University Hall

PROFESSORS NELSON, AVEY, LEIGHTON (EMERITUS), CHANDLER (EMERITUS), AND EVANS, ASSOCIATE PROFESSORS HARTMAN AND HINSHAW, ASSISTANT PROFESSORS REITHER, FOX, AND DONEY, MR. NEMETZ

GENERAL REQUIREMENTS FOR ADMISSION TO GRADUATE WORK:

Students seeking an advanced degree in philosophy should have completed an undergraduate major in philosophy, or its equivalent, in a university or college of recognized standing. Any student who has not completed an undergraduate major in the field will be required to add such courses as may, in the judgment of his advisory committee, be essential. Prospective students are urged to prepare for graduate work in this Department by taking related courses in other departments. The following are illustrative of such courses: For students of logic and metaphysics; mathematics and natural sciences, especially general theoretical physics, general and historical chemistry, general and historical zoology, particularly, 509; for students of ethics and the philosophy of religion: history, political science, psychology, and sociology; for students of the history of philosophy: European history, and the history of Greek, German, English, and French literatures.

SUPERVISION OF GRADUATE WORK IN PHILOSOPHY:

The work of every student seeking the M.A. or the Ph.D. degree in philosophy shall be done under the supervision of a committee appointed by the Chairman of the Department after consultation with the student. This committee will consist of the student's adviser who acts as chairman, and at least two other members of the Department. It will consider the fitness of the student for the degree sought, and make reports and recommendations to the Department concerning his progress and scholastic status.

The attention of students seeking advanced degrees is directed to the general regulations of the Graduate School in this Bulletin. The following requirements supplement those of the Graduate School:

REQUIREMENTS FOR THE MASTER'S DEGREE

1. The program for the degree will normally include twenty-five to thirty-five hours in philosophy, with the remainder of the required forty-five hours in related subjects.
2. The submission of a thesis embodying the independent investigation of an acceptable topic.
3. A reading knowledge of one foreign language, selected with the approval of the student's advisory committee. This requirement to be effective Autumn Quarter.
4. Examinations required of every candidate for the M.A. degree:
 - A. Comprehensive written examinations on the following:
 1. Field of the thesis and history of that field.
 2. History of Philosophy.
 3. Logic.
 4. Epistemology and Metaphysics.
 5. Ethics.
 If the field of the thesis falls within one of the subjects (2) to (5), then the examination on that subject and on (1) will be combined.
 - B. An oral examination on, and in defense of, the thesis.

REQUIREMENTS FOR THE PH.D. DEGREE

1. The course of study leading toward the degree shall be planned by the student, in consultation with his adviser, assisted by the other members of the student's advisory committee.
2. The submission of a dissertation embodying a definite contribution to knowledge.
3. Examinations required of every candidate for the Ph.D. degree:
 - A. Comprehensive written examinations on the following:
 1. History of Philosophy.
 2. Logic.
 3. Epistemology and Metaphysics.
 4. Ethics.
 5. One additional field, e.g., Aesthetics, Philosophy of Religion, Philosophy of Science, Social Philosophy, selected with the approval of the student's advisory committee.
 6. Two philosophers, selected with the approval of the student's advisory committee.

- B. A general oral examination on the subjects covered by the comprehensive written examinations. The general oral examination may also include questions on related fields whose study is a part of the student's graduate program.
- C. An oral examination on, and in defense of, the dissertation, and on the history of the field of the dissertation.

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

601. History of Ancient Philosophy. Five credit hours. Autumn Quarter. Mr. Fox.

The development of Philosophical thought in ancient Greece. Special attention is given to the pre-Socratics, Plato, Aristotle, Stoicism, Epicureanism, Neo-Platonism.

Not open to students who have credit for Philosophy 501.

602. History of Philosophy from Augustine to Hume. Five credit hours. Winter Quarter. Mr. Fox.

The development of European philosophy from the fourth to the eighteenth centuries. The medieval period is dealt with briefly in a number of lectures. Special attention is given to Descartes, Spinoza, Leibniz, Locke, Berkeley, and Hume.

Not open to students who have credit for Philosophy 502.

603. History of Philosophy from Kant through the Nineteenth Century. Five credit hours. Spring Quarter. Mr. Fox.

The development of European philosophy in the late eighteenth and nineteenth centuries. Special attention is given to Kant, Fichte, Hegel, Schopenhauer, Nietzsche, and the Utilitarians.

Not open to students who have credit for Philosophy 503.

604. Philosophy since 1900. Five credit hours. Autumn Quarter. General prerequisites must include ten hours of philosophy. Mr. Doney.

The development of European and American philosophy during the Twentieth Century.

***606. American Philosophy to 1900.** Three credit hours. Spring Quarter. General prerequisites must include ten hours of philosophy.

A comprehensive and critical study of Puritanism, Deism, and Transcendentalism.

Not open to students who have credit for Philosophy 506.

***607. American Philosophy since 1900.** Three credit hours. Autumn Quarter.

The pragmatic philosophies of James and Dewey will be studied in detail. The revolt against idealism, recent scientific methodology, and the leading ideas of Santayana, Whitehead and other contemporary American philosophers will be examined.

Not open to students who have credit for Philosophy 507.

609. Mediaeval Philosophy. Four credit hours. Spring Quarter. General prerequisites must include ten hours of philosophy including Philosophy 601, or 638 and 639. Mr. Nemetz.

An examination of the main trends in the thought of the middle ages, based on a study of characteristic works of some of the most important medieval philosophers.

618. Philosophy in Literature. Five credit hours. Autumn Quarter.

A study of the philosophical problems confronting man as reflected in selected classics of world literature, such as the Greek dramatists; Lucretius; Dante; Shakespeare; Goethe; Dostoevsky.

Not open to students who have credit for English 618.

***628. The Platonic Tradition in European Thought.** Five credit hours. Winter Quarter. General prerequisites must include Philosophy 638.

A study of the influence of Platonic ideas on later systems of European thought, Neo-Platonists, Christianity, the Florentine Academy, the Cambridge Platonists and English poets, etc.

***630. Philosophy of Augustine.** Three credit hours. General prerequisites must include ten hours of philosophy including Philosophy 601.

* Not given in 1954-1955.

An examination of the doctrines which formed the basis of a tradition in medieval thought; particular attention is given to the theory of knowledge, the foundations of ethics and the divisions of philosophy.

***631. Philosophy of Aquinas.** Three credit hours. Spring Quarter. General prerequisites must include ten hours of philosophy including Philosophy 601.

Analysis of the treatises on the existence of God, the nature of man, and law; consideration of Aristotelian influence in medieval controversies.

***632. Philosophy of Scotus and Occam.** Three credit hours. General prerequisites must include ten hours of philosophy including Philosophy 601.

Consideration of the Metaphysics of Scotus and the Logic of Occam as opposed developments within the Augustinian tradition; transition to the philosophy of the Renaissance.

633. Philosophy of Locke and Berkeley. Three credit hours. Autumn Quarter. General prerequisites must include ten hours of philosophy including Philosophy 602.

An intensive study of the philosophy of Locke and Berkeley based on a careful reading of selected works.

634. Philosophy of Hume. Three credit hours. Spring Quarter. General prerequisites must include ten hours of philosophy including Philosophy 602. Mr. Fox.

An intensive study of the philosophy of Hume based on a careful reading of selected works.

635. Philosophy of Descartes. Three credit hours. Winter Quarter. General prerequisites must include ten hours of philosophy including Philosophy 602. Mr. Doney.

An intensive study of the philosophy of Descartes based on a careful reading of selected works.

***636. Philosophy of Spinoza.** Three credit hours. General prerequisites must include ten hours of philosophy including Philosophy 602.

An intensive study of the philosophy of Spinoza based on a careful reading of selected works.

***637. Philosophy of Leibniz.** Three credit hours. General prerequisites must include ten hours of philosophy including Philosophy 602.

An intensive study of the philosophy of Leibniz based on a careful reading of selected works.

638. Philosophy of Plato. Five credit hours. Autumn Quarter. General prerequisites must include ten hours of philosophy including Philosophy 601. Mr. Fox.

An intensive study of the philosophy of Plato based on a careful reading of selected works.

639. Philosophy of Aristotle. Five credit hours. Winter Quarter. General prerequisites must include ten hours of philosophy including Philosophy 601. Mr. Nemetz.

An intensive study of the philosophy of Aristotle based on a careful reading of selected works.

***640. Post-Kantian German Idealism.** Three credit hours. General prerequisites must include ten hours of philosophy including 603.

A study of German Philosophy after Kant as presented in selected writings of such thinkers as Fichte, Schelling, Hegel and Schopenhauer.

641. Philosophy of Bradley and Royce. Three credit hours. Winter Quarter. General prerequisites must include ten hours of philosophy. Mr. Evans.

An intensive study of the philosophies of Bradley and Royce based on a careful reading of selected works.

642. Philosophy of James and Dewey. Three credit hours. Autumn Quarter. General prerequisites must include ten hours of philosophy.

An intensive study of the philosophies of James and Dewey based on a careful reading of selected works.

* Not given in 1954-1955.

***643. Philosophy of Bergson and Whitehead.** Three credit hours. Autumn Quarter. General prerequisites must include ten hours of philosophy.

An intensive study of the philosophies of Bergson and Whitehead based on a careful reading of selected works.

***644. Philosophy of Russell and Santayana.** Three credit hours. Winter Quarter. General prerequisites must include ten hours of philosophy.

An intensive study of the philosophies of Russell and Santayana based on a careful reading of selected works.

***645. Existentialism.** Three credit hours. Spring Quarter. General prerequisites must include ten hours of philosophy.

The origin and development of existentialist philosophy based on a study of such thinkers as Kierkegaard, Heidegger, Jaspers, Sartre, and Marcel.

***646. Kant: Critique of Pure Reason.** Five credit hours. Winter Quarter. General prerequisites must include Philosophy 603.

A study of the philosophy of Kant based on an intensive reading of the *Critique of Pure Reason*.

***647. Kant: Critique of Practical Reason and Critique of Judgment.** Five credit hours. General prerequisites must include Philosophy 646.

A study of the philosophy of Kant based on an intensive reading of the *Critique of Practical Reason* and the *Critique of Judgment*.

649. Advanced Logic I. Four credit hours. Autumn Quarter. General prerequisites must include a course in logic or consent of the instructor. Mr. Nelson.

Logic of propositions, logic of classes, predicate logic.

650. Advanced Logic II. Four credit hours. Winter Quarter. General prerequisites must include Philosophy 649. Mr. Hinshaw.

Logical paradoxes and theory of types; deductive systems; types of order; infinity; critical examination of logical doctrine and analytic methods bearing on philosophical questions.

652. Philosophy of Science. Three credit hours. Winter Quarter. General prerequisites must include either five hours of philosophy and ten hours of science, or twenty hours of science. Mr. Hinshaw.

A study of the concepts and methods of science. The role of formal systems in the construction of theories. Methodological problems of particular sciences.

653. Philosophy of Religion. Five credit hours. Spring Quarter. General prerequisites must include five hours of philosophy. Mr. Evans.

A systematic study of fundamental religious concepts and problems: The idea and nature of God, the idea and nature of man, their relation to the world and to the problems of human destiny.

654. Conceptions and Methods of the Social Sciences. Three credit hours. Spring Quarter. General prerequisites must include ten hours of philosophy and ten hours of social science. Mr. Wolff.

An appraisal of the social sciences and their methodological and philosophical implications through a survey of their development and of their divergent and convergent conceptions today.

Lectures and discussions; student readings, reports, and papers.

***659. Introduction to the Geisteswissenschaften (Human Studies).** Five credit hours. Spring Quarter. General prerequisites must include ten hours of philosophy and ten hours of social sciences.

A study of philosophical anthropology as developed by such writers as Dilthey and Simmel. Lectures and discussions; student readings, reports, and papers.

661. Theory of Knowledge. Three credit hours. Spring Quarter. General prerequisites must include ten hours of Philosophy. Mr. Hinshaw.

A systematic study of major epistemological problems: the possibility, the origin, the foundations, the structure, the methods, the limits, the validity of knowledge.

* Not given in 1954-1955.

663. Problems in Metaphysics. Three credit hours. Winter Quarter. General prerequisites must include Philosophy 601, 602, 603 or the consent of the instructor. Mr. Nelson.

Nature of existence; substance, causation, and law; pluralism and monism; universals; space and time.

664. Systems of Metaphysics. Three credit hours. Spring Quarter. General prerequisites must include Philosophy 663 or the consent of the instructor. Mr. Nelson.

Realism, naturalism, idealism, positivism.

***665. Philosophy of History.** Five credit hours. Spring Quarter. General prerequisites must include ten hours in philosophy and ten hours in the social sciences.

A discussion of the place of history in the system of human knowledge, the philosophic significance of historical inquiry, and various theories of the nature and structure of historical process. Such writers as Plato, St. Augustine, Hegel, Marx, Spengler, and Toynbee will be considered.

666. Philosophy of Language. Three credit hours. Spring Quarter. General prerequisites must include ten hours of philosophy including 649 or 650.

An inquiry into semantics and other dimensions of languages analysis, the functions of language, the modes of meaning, the relation of linguistic structure to metaphysics.

671. Advanced Ethical Theory. Four credit hours. Winter Quarter. General prerequisites must include ten hours of philosophy.

A systematic analysis of selected ethical theories.

701. Minor Problems. Two to ten credit hours. Autumn, Winter, and Spring Quarters. Mr. Hartman, Mr. Avey, Mr. Reither.

Students ordinarily expect to take this course for from two to five credit hours, but honors students may receive credit up to ten hours.

Topics for special study may be chosen from the following fields: ethics, logic, metaphysics, epistemology, philosophy of religion, esthetics, and history of philosophy.

FOR GRADUATES

800 and 800 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

These general prerequisites include acceptable foundation courses either in psychology, logic and ethics, or in the history of philosophy, and in some cases in all of these subjects.

***807. Seminar in the Philosophy of Religion.** Three credit hours. Autumn Quarter. Mr. Evans.

A study of one of the recent Gifford Lectures on Natural Religion.

***821. Seminar in Logic.** Three credit hours. Spring Quarter.

***822. Seminar in Metaphysics.** Three credit hours. Spring Quarter.

***823. Seminar in Theory of Knowledge.** Three credit hours. Autumn Quarter.

824. Seminar in Ethics and Theory of Value. Three credit hours. Winter Quarter.

***825. Seminar in the History of Philosophy.** Three credit hours. Autumn Quarter. Mr. Avey.

950. Research in Philosophy. Autumn, Winter, and Spring Quarters. Staff.

For Philosophy of Education see Education 607.

For Philosophical Foundations of Economics see Economics 885-886-887.

* Not given in 1954-1955.

PHONETICS

(See Speech)

PHOTOGRAMMETRY

(See Geodesy, Geology)

PHOTOGRAPHY

Office, 4 Brown Hall

PROFESSOR DAVIS, ASSISTANT PROFESSORS WAGNER AND BINAU

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

615. Motion Picture Photography. Three credit hours. Winter Quarter. Two lectures and one two-hour laboratory period each week. General prerequisites must include Photography 625 or permission of the instructor. Mr. Wagner.

An advanced course in motion picture production, with special emphasis on the 16-mm. field. The mechanics and principles of specialized motion picture cameras, film editing, photographic sound recording and reproduction, and production planning.

Not open to students who have credit for Photography 515.

625. Scientific Photography. Three credit hours. Autumn Quarter. Two lectures and recitations and two two-hour laboratory periods each week. General prerequisites must include a year of elementary or general chemistry and in addition at least twenty Quarter hours in a scientific major. Mr. Davis, Mr. Binau.

This course is designed for students of physics, chemistry, astronomy, biology, and other sciences who need a knowledge of the principles and techniques of photography as an aid to their scientific work. Special attention is given to the nature of photographic processes, characteristics of photographic materials and the applications of photography to science. The laboratory exercises will be selected as far as possible to meet the needs of individual students.

650. Advanced Photography. Three credit hours. Winter Quarter. Two lectures and two two-hour laboratory periods each week. General prerequisites must include an acceptable course in photographic processes or Photography 625. Mr. Binau.

A continuation of Photography 511 or 625, dealing mainly with projection printing, special effects, photo-engraving, lens testing, color photography, miniature camera work.

699. Minor Problems in Photography. Three to five credit hours. Autumn, Winter, and Spring Quarters. Conference, library and laboratory work. General prerequisites must include Photography 625 and 650, and fifteen Quarter hours of elementary or general chemistry and/or physics and consent of the instructor. This course may be repeated until the student has accumulated not to exceed ten Quarter hours of credit. Mr. Davis, Mr. Wagner, Mr. Binau.

This course is designed to permit a properly qualified student to avail himself of the library and laboratory facilities of the department for adding to his knowledge and techniques in some subject in photography and for carrying out minor investigations.

PHYSICAL EDUCATION

MEN'S DIVISION

Office, 124 Physical Education Building

PROFESSORS LARKINS, OBERTEUFFER, ASHBROOK, DANIELS, CUSHMAN, AND HAYES, ASSOCIATE PROFESSORS STALEY, L. HESS, AND HIXSON, ASSISTANT PROFESSORS BENNETT, BIGGS, KOVACIC, AND MONTONARO

WOMEN'S DIVISION

Office, 201 Pomerene Hall

PROFESSORS PALMER, D. WIRTHWEIN, AND PATTERSON, ASSOCIATE PROFESSORS MORDY, ALLENBAUGH, GILMAN, WATSON, AND STEIN, ASSISTANT PROFESSORS ALKIRE AND RUPERT, MISS CRAFTS

Prerequisites for Graduate Work: Unconditional admission to graduate work in physical education is based on presentation of credit from accredited institutions as follows: at least fifteen Quarter hours in professional education; at least nine Quarter hours in either human anatomy or physiology or both; and at least twenty-four Quarter hours in physical and health education. These twenty-four Quarter hours (sixteen semester hours) must correspond with the Ohio teaching minor in physical and health education as established by the Ohio Department of Education. Candidates in health education only must possess the equivalent of the requirements listed by the University as the health education teaching field.

In cases where deficiencies in previous training are found, all or part of these prerequisites will be assigned and work toward their removal must be taken in addition to the general graduate degree requirements.

Requirements for the Ph.D. Degree: Candidates for the Ph.D. degree must, in addition to fulfilling the requirements of the Graduate School, elect twenty hours of work in one field related to physical and health education chosen in conference with the committee assigned to the student.

Matters pertaining to the administration of the graduate program in physical and health education should be referred to the chairman of graduate courses in the department.

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

†601. Principles of Football Coaching and Management (Men). Three credit hours. General prerequisites must include coaching experience.

A course for advanced students of football. The course will consider the principles underlying various types of football strategy, the designing of plays, methods of teaching and controlling players; also, special problems of management, such as those connected with selecting, handling equipment, and making trips.

609. Health Education for Elementary Teachers. Three credit hours. One Quarter. Autumn, Winter, Spring. Three lecture periods each week. Mr. Oberteuffer, Miss Palmer, Miss Allenbaugh.

A consideration of the teacher's responsibility for practicing and maintaining high standards of personal hygiene and health, and a first-hand study of the environmental and social conditions and problems of community health.

Not open to students who have credit for Education 664.

615. Problems in Intramural Sports (Men and Women). Two credit hours. Spring Quarter. One two-hour meeting each week. Mr. Staley.

A critical analysis of intramural sports programs with a view to their justification from the standpoint of objectives, age level and contribution to the general welfare of the students participating. Problems of policy and administration of programs on the elementary, secondary, and college levels will be studied. Lectures, readings, reports, and discussions.

621. Principles of Physical Education (Men and Women). Five credit hours. One Quarter. Autumn and Spring. Mr. Oberteuffer.

A study of the origins and nature of modern physical education as a developmental experience, and as a medium for education. The contribution of physical education to organic growth and development, to the development of personal resources and growth in social relationships. Relationships of principles of physical education to administration and to curriculum formation.

† Not given during the academic year, 1954-1955.

625. Evaluation in Physical Education (Men and Women). Three credit hours. Winter Quarter. Two lectures and one two-hour laboratory period each week. Mr. Ashbrook.

A critical study of ways and means of evaluating biological, social and psychological outcomes of programs of physical education. Analyses of various specific tests and standards in use in schools will be made.

630. Adapted Physical Education (Men and Women). Five credit hours. One Quarter. Section for men, Autumn, Mr. Daniels. Section for women, Spring, Miss Gilman. Eight lecture laboratory hours each week. General prerequisites must include Physical Education 691.

A basic course in the organization and administration of individual physical education programs for atypical students or students with special problems. Laboratory experience in the application of sports therapy, swimming therapy and special conditioning exercises will be arranged. Discussion of individual programs of physical education for the most prevalent types of disabilities found in school and college population.

631. Dance in the Modern Period. (Men and Women). Three credit hours. Winter Quarter. One lecture and four laboratory periods each week. General prerequisites must include a course in the theory and practice of physical education or the equivalent. Miss Alkire.

Analysis of teaching procedures with study and practice in directing dance as a creative expression. Readings and discussions concerning the development of dance in education.

632. Dance Composition (Men and Women). Three credit hours. Spring Quarter. Three laboratory meetings each week. General prerequisites must include permission of the Department adviser upon satisfactory evidence of knowledge and skill in dance. Miss Alkire.

Experience and guidance in creating artistic dance forms. Study of dance as it is applicable to other arts with emphasis on its particular relationship to music and other forms of accompaniment. Supplementary readings and discussions.

***634. Current Problems in Dance Education (Men and Women).** Three credit hours. Five lectures and one conference hour each week. General prerequisites must include at least one year's experience as a teacher, Physical Education 621 or the equivalent and permission of the instructor.

A discussion of the problems encountered by the high school and college dance teacher relating to dance accompaniment, creative activity, dance production, dance as communicative force, and dance as a recreation. Other problems to be considered as selected by the students.

635. Current Problems in Physical Education for Girls and Women (Men and Women). Three credit hours. Spring Quarter. General prerequisites must include experience in teaching in schools or college. Miss Palmer.

A consideration of the problems of teachers of physical education, including public relations, legal responsibilities, finances, interscholastic activities, policies and standards for physical education programs.

641. Personal Health Problems (Men and Women). Three credit hours. Autumn Quarter. Three discussion periods each week. Mr. Cushman.

This is an advanced course in personal health problems. It is so conducted that a student does extensive reading in problem areas of his personal interest and works with others toward the solution of certain health problems selected by the group.

644. The Teaching of Health. Four credit hours. Spring Quarter. Three lecture and two laboratory periods each week. General prerequisites must include Physical Education 692 or the equivalent. Mr. Oberteuffer, Mr. Cushman, Miss Paterson.

A study of the principles, materials, methods, and resources involved in teaching health to students. A study of the opportunities for integration of health material with other subjects of the organized curriculum. Actual participation in the teaching of health to secondary and elementary school pupils.

645. Organizational Relationships in School Health Education. Three credit hours. Winter Quarter. General prerequisites must include Physical Education 644. Miss Paterson, Mr. Oberteuffer.

* Not given in 1954-1955.

This course proposes to continue the orientation of the student in matters of health education, with particular reference to public and organizational relationships. A discussion of the administration of the school health program and the part which the school plays in the total community health program. A discussion of the official and unofficial health organizations. A consideration of school health policies and the principles underlying the school and community health programs.

646. Professional Preparation of Teachers in Physical and Health Education (Men and Women). Three credit hours. Spring Quarter. Three class meetings each week. Permission of the instructor must be obtained. Miss Paterson.

The principles underlying the professional preparation of teachers in physical and health education; curriculum construction; selection of candidates; supervised teaching; staff personnel; problems pertaining to professional students.

647. The Teaching of Physical Education (Men and Women). Three credit hours. One Quarter. Section for Men, Winter. Section for Women, Winter. Two lectures and three laboratory periods each week. General prerequisites include satisfactory proficiency in physical education activities. Section for men, Mr. Ashbrook, Mr. Hess; section for women, Miss Crafts.

The purpose of this course is to develop teaching competencies for prospective teachers of physical education. Students will study, observe, and participate in various phases of the school physical education program including: developing units of instruction, lesson planning, class organization and management, teaching techniques related to motor learning, and methods of evaluating pupil progress.

648. The Teaching of Physical Education (Men and Women). Three credit hours. One Quarter. Section for Men, Spring. Section for Women, Spring. Two lectures and three laboratory periods each week. General prerequisites must include satisfactory proficiency in physical education activities. Section for men, Mr. Hess, Mr. Hixson; section for women, Miss Mordy.

A continuation of Physical Education 647.

649. Camp Administration (Men and Women). Three credit hours. Spring Quarter. Three lecture-laboratory periods each week. Lectures, readings, and field demonstrations. General prerequisites must include experience in camp counselling. Prerequisite for social administration students, Sociology 645. Prerequisite for physical education and education students, ten hours of sociology, and courses in the theory and practice of physical education. Mr. Staley.

The organization and direction of camps, particularly summer camps for boys and girls. Special attention is given to the social and educational program for adolescents. Designed for those preparing for administrative positions. Consideration of budgets, equipment, camp sites, program personnel. Practical observations and demonstrations.

651. Minor Problems in Physical Education (Men and Women). One to four credit hours. Autumn, Winter, and Spring Quarters. Permission of the adviser must be obtained. The staff.

This course is designed primarily for seniors and graduate students to provide them with an opportunity for the investigation of their professional problems: (a) School Health and Physical Education, (b) Dance.

†660. School Health Education Workshop. Four credit hours for three-week workshop. Methods and material for health teaching, the school health program, school and community organization for health education, and problems of concern to workshop participants. Full time of students is required, therefore registrants are not permitted to take other University work concurrently. Open by permission of the instructor to graduate students who are teachers and administrators, school physicians and nurses, and to experienced teachers who in the opinion of the workshop committee have an educational background in the subject matter of the workshop which will be adequate for intensive work in this field.

Graduate students must demonstrate satisfactory ability to deal critically

† Not given during the academic year, 1954-1955.

and constructively with a phase of the total problem approved as appropriate for graduate study and must submit individual papers covering in detail their contribution to the total workshop problem. Mrs. Fogle.

682. Organization and Administration of Physical Education (Men and Women). Five credit hours. Winter Quarter. Five lectures each week. General prerequisites must include Physical Education 621 or equivalent. Section for men, Mr. Daniels; section for women, Miss Palmer.

The policies in the organization and administration of the Physical Education program; classification of students, staff, teaching load, time schedule, finances, etc. The administration of the Physical Education plant; gymnasium, locker rooms, swimming pool, equipment, records. Intra-school relationships. Intramural and interscholastic relationships.

685. Safety, First Aid and Care of Injuries (Men). Four credit hours. Autumn Quarter. Five class hours each week. General prerequisites must include ten hours of anatomy and physiology. Mr. Biggs.

A consideration of the methods of prevention and care of injuries occurring in physical education and competitive sports. The course also includes a discussion of the conditioning of men for athletic contests and of safety provisions important to the conduct of Physical Education. Successful completion of this course leads to the Red Cross standard or advanced certificate in first aid.

691. Kinesiology (Men and Women). Three credit hours. Section for men, Autumn and Winter Quarters, Mr. Kovacic; Section for women, Winter Quarter, Miss Stein. Four lecture-laboratory periods each week. General prerequisites must include acceptable courses in human anatomy.

The science of bodily movement. Basis for: prescription of activities in individual physical education; identification of common athletic injuries; form and style in athletic performance; analysis of coordination in sports, gymnastics, and ordinary activities of daily life.

Open only to majors in Physical Education.

692. School Health Services (Men and Women). Three credit hours. One Quarter. Autumn and Winter. Mr. Cushman.

A presentation of the principles underlying the school health service program. A consideration of the problems of the health of the school child and the teacher. A study of the teacher's role in medical inspections, physical examinations and control of common school diseases. Observations will be made in schools of physical examinations, systems of record keeping, follow-up services, and classes for the handicapped.

693. Advanced Problems in Adapted Physical Education (Men and Women). Three credit hours. Autumn Quarter. Three lectures each week. General prerequisites must include Physical Education 691 and 630 or the equivalent. Section for men, Mr. Daniels. Section for women, Miss Gilman.

A continued and advanced study of the organization of physical education programs for atypical students and students with special problems; a study of the most common departures from normal with respect to social psychological and organic variations; the relationship of the school medical service and health examination to placement in physical education.

695. Advanced Kinesiology. Three credit hours. Spring Quarter. Three lecture periods each week. Elective. General prerequisites must include at least fifteen hours of zoology, anatomy, physiology; Physical Education 630 and 691 and permission of the instructor. Miss Stein.

An advanced course in kinesiology. A consideration of osteology and articulation, muscle structure, laws of mechanics applicable to body movements. An application of principles of physiology of exercise to physical education activities and general body movements. An analysis of movements occurring in occupational, recreational, and corrective physical activities.

NOTE: For course in the History of Physical and Health Education, see the Department of Education, Course 642.

For course in the Physiology of Exercise see the Department of Physiology, Course 640.

For course in Public Recreation: Its Organization and Administration, see the Department of Social Administration, Course 855.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

801. Seminar in School Health Education (Men and Women). Two credit hours. Autumn Quarter. The staff.

802. Seminar in Physical Education (Men and Women). Two credit hours. Winter Quarter. The staff.

803. Seminar in Recreation (Men and Women). Two credit hours. Spring Quarter. The staff.

805. Physical Education in Schools and Colleges (Men and Women). Three credit hours. Autumn Quarter. General prerequisites must include Physical Education 621 or its equivalent. Mr. Oberteuffer.

A course for advanced students in the application of principles to problems of curriculum and administration. A critical review of current practice and outcomes.

810. Survey of Research in Physical Education (Men and Women). Three credit hours. Autumn Quarter. Mr. Ashbrook.

A survey and evaluation of published reports of research in the field of physical education.

816. Problems in Interscholastic and Intercollegiate Athletics (Men and Women). Three credit hours. Winter Quarter. Mr. Daniels, Miss Palmer.

The relation of athletics to education; problems of athletic organization; eligibility; finance; current trends and developments in management and purpose; public relations.

820. Problems in Physical and School Health Education (Men and Women). Three credit hours in (a), (b) or (c) and not more than a total of six credit hours in the course as a whole. Winter Quarter. Three lecture and recitation periods each week. Mr. Cushman, Miss Gilman, Mr. Daniels.

Advanced problems in curriculum construction and program building. The relation of physical and health education to social, educational, and public health problems. Students will work individually or in groups toward the solution of their problems. Special investigation and experience in after care of handicapped persons (b).

(a) School Health Education. Three credit hours. Mr. Cushman.

(b) The Physically Handicapped. Three credit hours. Miss Gilman, Mr. Daniels.

(c) Physical Education. Three credit hours. Mr. Oberteuffer.

823. Organic Science as Applied to Physical Education and Health Education. Five credit hours. Spring Quarter. General prerequisites must include ten hours of physiology, ten hours of chemistry, and ten hours of biology or its equivalent. Mr. Ashbrook.

This elective course has been planned for graduate students who need a systematic review of the fundamental sciences underlying physical and health education. It consists of an intensive series of lectures and demonstrations in the laboratory, supplemented by extensive reading. The purpose of the course will be to develop the integration of the sciences—chemistry, biology, anatomy, physiology—to the fields of physical education and health education.

826. Supervision of Physical and School Health Education (Men and Women). Four credit hours. Autumn Quarter. Permission of the instructor is required. Miss Paterson.

A study of the opportunities and problems of the supervisor in city, county, and state school systems; the relations of the supervisor to the superintendent and to the teacher; rating teachers; methods of assisting teachers. Separate units of the course will consider supervisors problem unique to the sexes.

950. Research in Physical and School Health Education (Men and Women). Autumn, Winter, and Spring Quarters. The staff.

NOTE: For course in Public Recreation: Its Organization and Administration see the Department of Social Administration, Course 855.

PHYSICS AND ASTRONOMY

PHYSICS

Office, 107 New Physics Building

PROFESSORS H. NIELSEN, BLAKE (EMERITUS), DAUNT, LANDE, POOL, SHAFFER, ALPHEUS SMITH (EMERITUS), AND WILLIAMS, ASSOCIATE PROFESSORS COOPER, HEIL (EMERITUS), HESTHAL, KORRINGA, KURBATOV, NELSON, C. NIELSEN, OETJEN, PREBUS, SHAW AND ZUMSTEIN, ASSISTANT PROFESSORS BELL, DICKEY, DINGLE, ERICKSON, HARRIS, HAUSMAN AND HEER

Prerequisites for Graduate Work: Graduate work in physics presupposes the satisfactory completion of forty-five Quarter hours of undergraduate work in physics and chemistry and forty Quarter hours in mathematics including integral and differential calculus and differential equations. Students specializing in physics should have some knowledge of both organic and physical chemistry. If these requirements are not met at the time of admission, any deficiencies must be made up in excess of the regular requirements for a degree. Only students with high standing in their undergraduate work in physics, chemistry and mathematics will be admitted to graduate work in physics.

Requirements for the Master's Degree: The program of work leading to the Master's degree is not rigidly fixed. It is always planned after a consideration of the needs and interests of the student. In all cases it must provide an adequate foundation for further advanced work. (a) Each Quarter, prior to registration, a candidate for the Master's degree must plan his program with a member of the departmental Committee on Graduate Study. (b) Not later than two Quarters before the time at which the candidate expects to receive the Master's degree he must, after a conference with a member of the departmental Committee on Graduate Study, select the subject of his thesis and the instructor with whom he elects to work. (c) Each candidate for the Master's degree is required to pass a written examination on the elementary and intermediate principles of classical and modern physics. This examination must be taken before the completion of forty-five hours of work in physics and mathematics.

Requirements for the Degree Doctor of Philosophy: The course of study to be pursued for the Doctor's degree is arranged for each student by the departmental Committee on Graduate Study after consultation with the student and his adviser. Work in other departments may be recommended according to the needs of the individual student. In all cases, proper consideration must be given to the mastery of the broad fundamental principles necessary for productive scholarship. (a) All candidates for the Doctor's degree in physics are required to complete Mathematics 721, 722, and 723, in excess of the work in mathematics offered for the Master's degree. Other courses in mathematics are highly desirable and in some cases indispensable. (b) The student should meet the language requirement as early as possible. The normal language requirement is a dictionary reading knowledge of two of the following group: (1) German, (2) Russian, (3) French or Italian. Any deviation from this rule must be approved by the departmental staff. (c) Not later than four Quarters before the student expects to receive the Ph.D. degree he must, after a conference with a member of the departmental Committee on Graduate Study, select the field of his dissertation and the instructor under whose direction he elects to work. (d) Before being admitted to candidacy for the Doctor's degree the applicant is required to pass a written examination on theoretical mechanics and its applications; physical optics and atomic physics; electromagnetic phenomena; kinetic and quantum theory of matter; and mathematical methods in physics. These written examinations are followed by an oral examination as required by the Graduate School.

Seminars and Journal Club: Reports on current topics in physics and related fields are presented by graduate students and instructors at weekly meetings of the Journal Club and seminars on special subjects. All graduate students are expected to attend the Journal Club regularly and to take part in these discussions.

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51. Unless otherwise indicated, the prerequisites for "600" and "700" in Physics are one year of calculus and one year of college physics.

603. Intermediate Heat. Three credit hours. Spring Quarter. Mr. Erickson.

Introduction to the theory of heat with applications.

Not open for graduate credit to students majoring in Physics.

605. Geometrical Optics. Three credit hours. One Quarter. Autumn and Winter. Mr. Oetjen.

Advanced theory of geometrical optics including thick lenses, types of mirrors, combinations of lenses and mirrors, apertures, and aberrations in optical systems.

606. Introductory Physical Optics. Three credit hours. One Quarter. Winter and Spring. Mr. Oetjen.

Introduction to diffraction; interference and polarization phenomena. Application of these phenomena in the design and performance of optical instruments.

Not open for graduate credit to students majoring in Physics.

610. Electron Physics. Three credit hours. Winter Quarter. General prerequisites must include Physics 601 or equivalent. Mr. Bell.

Free electron gas theory of metals including thermionic emission, photo-electric emission, contact potentials, electro-thermal and magneto-electric effects. Discharge of electricity in gases.

612. Periodic and Transient Electric Currents. Three credit hours. Autumn Quarter. General prerequisites must include Physics 601 or equivalent. Mr. Dickey.

An introductory course on the response of circuits with constant parameters to both constant and variable voltages; electronic circuits and instruments used in physical research.

614. Introduction to Modern Physics. Three credit hours. One Quarter. Winter and Spring. Mr. H. Nielsen.

An intermediate discussion of some fundamental ideas of modern physics to prepare students for the specialized courses in that field. Topics include fundamental particles of matter; qualitative concepts of quantum theory and their historical development; emission and absorption processes; introductory ideas of atomic and molecular structure.

Not open for graduate credit to students majoring in Physics.

615. Introduction to Nuclear Physics. Four credit hours. Autumn Quarter. General prerequisites must include Physics 601 and 614 or equivalent. Mr. Pool.

Distribution of stable and radioactive nuclei; modes of nuclear disintegration; production of radioactive nuclei; interactions of nuclear radiations with matter; detection of nuclear products; basic nuclear equations; evidence for shell structure.

616. Advanced Physical Laboratory. Three credit hours. Any Quarter. Two three-hour laboratory periods each week. General prerequisites must include one year of college physics. Mr. Shaw, Mr. Zumstein.

This course is intended to give the advanced student in science practice in precise physical measurements, involving the use of high grade mechanical, optical, electrical and thermal instruments.

The work undertaken will be elected from the following topics:

- (a) Mechanics.
- (b) Optical Measurements.
- (c) Electrical Measurements.
- (d) Ionization and Radioactivity.
- (e) Heat.
- (f) Acoustics.
- (g) Spectroscopy.
- (h) X-rays (Winter only).

A student may repeat this course until he has obtained a maximum of twenty-four credit hours. Only three credit hours may be taken during any one Quarter. A student may accumulate not more than six credit hours in any one of the above topics.

628. Electronic Techniques in Physical Measurements. Three credit hours. Spring Quarter. Two three-hour laboratory periods each week. Mr. Bell, Mr. Dickey.

A laboratory study of fundamental electronic instruments and circuits used in physical research.

629. Experimental Infra-red Spectroscopy. Four credit hours. Winter Quarter. One lecture and two three-hour laboratory periods each week. Mr. Oetjen, Mr. Bell.

A course in experimental techniques of infra-red spectroscopy; sources and detectors of infra-red radiation; design, adjustment and operation of various types of prism and prism-grating infra-red spectrometers; assembling and interpretation of sample data.

633. Nucleonic Measurements and Instrumentation. Three credit hours. One Quarter. Winter and Spring. One lecture and four hours of laboratory each week. General prerequisites must include Physics 615 and permission of the instructor. Mr. Pool.

Emphasis will be put on the proper operation and construction of instruments used in nuclear determinations. Typical experiments will be performed with a cloud chamber, geiger counter, ionization chamber, beta-ray spectrograph and the cyclotron.

635. Geometrical Optics Laboratory. Two credit hours. Winter Quarter. One four-hour laboratory period each week. Physics 605 must be included in the general prerequisites or taken concurrently. Mr. Oetjen.

Selected intermediate experiments in geometrical optics.

636. Physical Optics Laboratory. Two credit hours. Spring Quarter. One four-hour laboratory period each week. Physics 606 must be included in the general prerequisites or taken concurrently. Mr. Oetjen.

Selected intermediate experiments in physical optics.

643. General Meteorology. Three credit hours. Autumn Quarter; Summer Quarter of even-numbered years. General prerequisites must include fifteen hours of natural science. Mr. Dingle.

The study of the atmosphere and its phenomena. Personal observation and prediction of weather events.

Not open to students who have credit for Physics 510.

644. Agricultural Meteorology. Three credit hours. Winter Quarter. General prerequisites must include fifteen hours of natural science including an elementary course in Physics or Physics 643 or permission of the instructor. Mr. Dingle.

The use of meteorological information in the practice of agriculture and research. Frost prediction and control. Precipitation in relation to soil conservation. Artificial controls for precipitation, microclimates, use of climatological data, dusting and spraying operations, etc.

Not open to students who have credit for Physics 511.

645. Acoustics for Students of Music and Speech. Three credit hours. Autumn Quarter. This course cannot be counted toward a major in physics. Mr. Shaw, Mr. Shaffer.

A descriptive non-mathematical treatment of acoustics with applications to music and speech, including such topics as the following: production, propagation and reception of sound; characteristics of sounds; room acoustics; acoustical apparatus; hearing, etc.

647-648. Physical Meteorology. Three credit hours. 647, Winter Quarter; 648, Spring Quarter. General prerequisites must include Physics 603 or taken concurrently. Mr. Dingle.

Theoretical treatment of atmospheric processes; cloud physics, circulation, turbulence, electricity, etc.

651-652. Synoptic Meteorology Laboratory. Two credit hours. 651, Winter Quarter; 652, Spring Quarter. General prerequisites must include either Physics 643; or an elementary course in Physics plus fifteen hours of natural science. Mr. Dingle.

The compilation of meteorological data and the use of graphic methods in their presentation. Prognostic weather maps, forecasting and verification. Operational predictions.

Not open to students who have credit for Physics 551-552.

701. Minor Problems in Physics. One to fifteen credit hours. All Quarters. Conference, library and laboratory work. General prerequisites must include satisfactory advanced courses in experimental and theoretical physics. A student may repeat this course and may spend all or any part of his time on it during a Quarter. All instructors.

This course is designed to permit any properly qualified student to avail himself of the library and laboratory facilities of the department for carrying out a minor investigation for adding to his knowledge and technique in some branch of physics. A student may elect to work in experimental or theoretical physics, astrophysics, physical meteorology or physiological optics.

Students who have specialized interest in some field of physics may elect this course to secure an opportunity for *independent reading and study* under the supervision of an instructor. The student will be permitted to choose the instructor and, subject to his approval, the field in which this reading is to be done.

702. Kinetic Theory of Gases. Three credit hours. Autumn Quarter. General prerequisites must include Physics 603 or equivalents, and Mathematics 601 and 611 or 608 and 609. Mr. Daunt.

Introduction to kinetic theory of gases with application to physical systems.

Not open to students who have credit for Physics 604.

703-704. Thermodynamics. Three credit hours. Winter and Spring Quarters. General prerequisites must include Physics 603 and Mathematics 601 and 611. Mr. Daunt.

Modern thermodynamics treated from a physical viewpoint including a full treatment of the concept of entropy and its application to modern theories of specific heats, the third law, phase and lattice changes of higher orders than the first, and surface phenomena. The second part of the course will be devoted to applications of thermodynamics to low temperature physics including liquefaction of gases, thermodynamical theories of superconductivity and liquid helium, magnetic phenomena and nuclear paramagnetism.

Not open to students who have credit for Physics 803-804.

***709. Wave Motion and Sound.** Three credit hours. Autumn Quarter. General prerequisites must include Physics 601 and Mathematics 611 or equivalent. Given in alternate years. Mr. Shaw.

Theory of wave motion; production, propagation and detection of sound waves; measurements and applications.

Not open to student who have credit for Physics 621.

712. Fundamentals of Electricity and Magnetism. Three credit hours. Autumn Quarter. General prerequisites must include Physics 601 or equivalent and Mathematics 661. Mr. Heer.

Mathematical theory of classical electricity and magnetism.

Not open to students who have credit for Physics 608.

713. Electromagnetic Field Phenomena. Three credit hours. Winter Quarter. General prerequisites must include Physics 601, 712 or equivalent, and Mathematics 611 or equivalent. Mr. Dickey.

An introductory course in Maxwell's theory of the electromagnetic field.

Not open to students who have credit for Physics 613.

714. Electromagnetic Theory of Light. Three credit hours. Spring Quarter. General prerequisites must include Physics 606 and 713 or equivalent. Mr. Prebus.

Mathematical treatment of physical optics including propagation of plane electromagnetic waves; reflection; refraction; absorption; double refraction; advanced theory of diffraction.

716. Introduction to Theory of Solids. Three credit hours. Spring Quarter. General prerequisites must include Physics 610 or equivalent. Mr. Shaw. Fundamental properties of solids with emphasis on conduction in metals and semi-conductors.

718. Modern Atomic Spectroscopy. Three credit hours. Autumn Quarter. General prerequisites must include Physics 601 and 614 or equivalent. Mr. Cooper, Mr. Williams.

Introduction to classification of line spectra of atoms, including discussion of such topics as quantum numbers, selection rules, line strengths, Zeeman and Stark effects, and forbidden transitions.

Not open to students who have credit for Physics 618.

719. Spectra and Structure of Molecules. Three credit hours. Spring Quarter. General prerequisites must include Physics 601 and 614 or equivalent. Mr. Bell, Mr. Shaffer.

Review of experimental methods and data on band spectra of molecules; empirical classification of spectra and correlation with molecular energy states; relation of energy expressions to molecular structure; selection rules and intensities of transitions; macroscopic properties of molecules obtained from band spectra; applications to chemical problems.

Not open to students who have credit for Physics 619.

* Not given in 1954-1955.

720. X-rays and Atomic Structure. Three credit hours. Winter Quarter. General prerequisites must include Physics 601 and 614 or equivalent. Mr. Cooper.

Production, measurement and effects of X-rays, including gamma rays; classical electron theory of the reflection, refraction, absorption and scattering of X-rays; quantum theory of the origin of X-ray spectra and structure of heavy atoms.

Not open to students who have credit for Physics 620.

721. Fundamentals of Nuclear Physics. Three credit hours. Winter Quarter. General prerequisites must include Physics 615 or equivalent. Mr. Harris.

Structure and stability of nuclei; alpha decay; beta decay; other nuclear reactions; nuclear energy levels; experimental observations and their theoretical interpretations. Recommended preparation for this course includes Physics 718 and a concurrent or previous course in quantum mechanics.

722. High Energy Physics and Cosmic Rays. Three credit hours. Spring Quarter. General prerequisites must include Physics 615 and 721 or equivalent. Mr. C. Nielsen.

Production of high energy particles; reactions; detection techniques; primary cosmic radiations; interaction of cosmic rays with matter; mesons and other unstable particles.

***723. Nuclear Reactors and Neutron Physics.** Three credit hours. Spring Quarter. General prerequisites must include Physics 615 and 702 or equivalent. Mr. Pool.

Neutron sources; scattering and capture of neutrons; nuclear fission; resonance phenomena; material damage; diffusion; power production.

726. Methods of Theoretical Physics. Three credit hours. Autumn Quarter. Mr. Nielsen, Mr. Bell.

An introductory course coordinating the methods of solving problems in such fields of classical physics as dynamics of particles and systems of particles, wave motion, electrodynamics, heat flow, etc. The course is especially adapted to needs of students in chemistry and engineering but is also open to students majoring in physics.

Not open to students who have credit for Physics 626 or 601.

Open to physics graduates of other institutions and non-physics graduates of other departments.

727. Methods of Quantum Mechanics I. Three credit hours. Winter Quarter. General prerequisites must include Physics 601 and 614 or equivalent. Mr. Nielsen, Mr. Bell.

Introduction to Schroedinger and matrix techniques of quantum mechanics; applications to simple problems, particularly those of chemical interest; perturbations; quantum mechanical resonance; etc. It is helpful for Physics 726 or 740 to precede this course.

Not open to students who have credit for Physics 627.

728. Methods of Quantum Mechanics II. Three credit hours. Spring Quarter. General prerequisites must include Physics 727. Mr. Nielsen, Mr. Bell.

A continuation of Physics 727 with applications to more complicated problems; mechanics of atoms and molecules; approximate methods of solution.

730. Analysis of Physical Measurements. Three credit hours. Spring Quarter. General prerequisites must include Physics 601, 614 and six hours of advanced laboratory or equivalent. Mr. C. Nielsen.

This course deals with the nature of physical measurements; types of data and their analytical treatment; relations between physical situations and mathematical distributions; curve fitting; errors; application of analytical methods to typical physical problems.

740-741-742. Introduction to Theoretical Physics. Three credit hours. Autumn, Winter, and Spring Quarters. General prerequisites must include Mathematics 601 and Physics 601 or 726, or equivalent. Mr. Shaffer.

A fundamental course in classical mechanics including reference frames and their trans-

* Not given in 1954-1955.

formations; dynamics of particles and systems of particles; dynamics of rigid rotators; Hamilton's principle; Lagrange's equations; special relativity; introductory elasticity and fluid dynamics.

Not open to students who have credit for Physics 623, 624, 625.

NOTE: TEACHING COURSES. For the Teaching Course in this department see the Department of Education, Course 684.

FOR GRADUATES

800 and 800 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 61.

A reading knowledge of German and French is highly desirable.

805-806. Electromagnetic Field Theory. Three credit hours. Autumn and Winter Quarters. General prerequisites must include Physics 712 and Mathematics 721 or equivalent. Mr. Prebus.

Electro- and magneto-statics; Maxwell's theory of electrodynamics; general classical theory of emission, propagation and absorption of electromagnetic waves; boundary value problems; principle of relativity.

***807. Modern Electromagnetic Field Theory.** Three credit hours. Spring Quarter. General prerequisites must include Physics 806 and Mathematics 721 or equivalent. Mr. Prebus.

Selected topics from quantum electrodynamics.

***813. Line Spectra and Atomic Structure.** Three credit hours. Spring Quarter. General prerequisites must include Physics 718 and either 727 or 818. Mr. Landé.

Interpretation of spectral series, stationary states and term values, spinning electrons and fine line structure, vector models of atoms, Zeeman effect and Stark effect, intensity and polarization of spectral lines, Pauli's exclusion principle, hyperfine structure and nuclear moments.

817-818. Quantum Mechanics. Three credit hours. Autumn and Winter Quarters. General prerequisites must include Physics 718 or 719 and Mathematics 601 and 611. Mr. Landé.

Contrast between waves and particles. Uncertainty principle. Schrödinger's wave equation. Perturbation theory. Spectral lines of atoms and molecules. Compton and Raman effects. Molecular forces. Quantum statistics.

819. Advanced Quantum Mechanics. Three credit hours. Spring Quarter. General prerequisites must include Physics 818. Mr. Landé.

A topic such as the quantum theory of radiation, of solid bodies, or of atomic nuclei, will be discussed in detail.

820-821. Theory of the Atomic Nucleus. Three credit hours. One Quarter. Winter and Spring. General prerequisites must include Physics 721 and either 818 or 728.

An up-to-date development of nuclear theory with particular attention to the status of theory versus experiment. Topics include nuclear forces and stationary states, transformations, scattering of nuclear particles, nuclear reactions, many-body aspects of nuclear processes.

824. Statistical Mechanics. Three credit hours. Autumn Quarter. General prerequisites must include Physics 604, 727 or 818, and 740. Mr. Daunt.

Statistical mechanics and its relation to thermodynamics and to quantum theory; classical, Fermi-Dirac, and Einstein-Bose statistics; statistical equilibrium and steady change. Applications to the specific heats of gases and crystals, vapor pressure, chemical equilibrium, imperfect gases, dissociation and ionization, thermionics, temperature radiation, fluctuation and Brownian movement, viscosity and conduction of heat and electricity.

***825. Applications of Statistical and Quantum Mechanics.** Three credit hours. Winter Quarter. General prerequisites must include Physics 824 or permission of the instructor. Mr. H. Nielsen.

The application of quantum mechanics to a special problem such as the second quantization of fields; the theory of magnetism; the application of atomic theory in a special field such as astrophysics; the theory of the solid state. The topic for the year will be selected from the above list according to the interests of the students registered for the course.

* Not given in 1954-1955.

833-834. Theory of the Solid State. Three credit hours. Winter and Spring Quarters. General prerequisites must include Physics 716, 728 and Mathematics 721 or equivalent. Mr. Korringa.

Modern theory of the solid state including the classification of solids and a theoretical discussion of physical properties such as cohesion, specific heats, conductivity and magnetism.

840-841. Advanced Dynamics. Three credit hours. Autumn and Winter Quarters. General prerequisites must include Physics 742 and Mathematics 661 or equivalent. Mr. Korringa.

Advanced analytical dynamics starting from Lagrange's equation through variational theorems and Hamilton's canonical equations to the general transformation theory; basic equations for rigid rotators; phenomenological theory of elasticity and vibrations.

851. Molecular Spectra I. Three credit hours. Autumn Quarter. General prerequisites must include introductory courses in spectroscopy and quantum mechanics. Given in alternate years. Mr. Nielsen.

Separation of the electronic, vibrational and rotational aspects of the spectra of molecules; derivation of quantum-mechanical Hamiltonian for vibrating and rotating molecules; discussion of wave functions, allowed energies and selection rules of harmonic oscillators and of symmetric and asymmetric rotators; interactions between oscillation and rotation; origin and interpretation of rotation-vibration spectra.

852. Molecular Spectra II. Three credit hours. Winter Quarter. General prerequisites must include introductory courses in spectroscopy and quantum mechanics. Given in alternate years. Mr. Nielsen.

General theory of gyro-vibronic energy states of molecules; symmetry properties of various molecular configurations and group theory classification of energy states; origin and interpretation of electronic spectra of diatomic and polyatomic molecules; applications of data on molecular spectra to related chemical and physical phenomena. It is desirable but not necessary that Physics 851 be taken before this course.

860-†861-*862. Mathematical Physics. Three credit hours. Autumn, Winter, and Spring Quarters. General prerequisites must include Physics 742 and Mathematics 607 and 661 or their equivalent. Mr. Landé.

Advanced mathematical methods and their application to various branches of classical and modern theoretical physics. The topic for a given Quarter will be selected according to the interests of the students registered for the course. The three Quarters will in general be independent and may be taken separately.

881-882-883. Seminar in Physics. One credit hour. Autumn, Winter, and Spring Quarters. One two-hour meeting each week. General prerequisites must include acceptable specialized courses and permission of the instructor. This course may be repeated for credit. All instructors.

Seminars will be conducted by various members of the staff on topics of current interest in their fields of specialization. Students will participate in the presentation and discussion of material.

950. Research in Physics. Autumn, Winter, and Spring Quarters. Library, conference, and laboratory work. General prerequisites must include acceptable courses in physics and mathematics. The student may spend a part or all of his time on his chosen field of research. This course is intended primarily to meet the needs of students who must complete either a thesis or a dissertation as part of the requirements for a degree. Department staff.

* Not given in 1954-1955.

† Not given during the academic year, 1954-1955.

ASTRONOMY

Office, Emerson McMillin Observatory

PROFESSOR HYNEK, DIRECTOR, ASSISTANT PROFESSOR SLETTEBAK

Offices, Perkins Observatory, Delaware, Ohio, and 216 New Physics Building

PROFESSORS BOBROVNIKOFF, HYNEK, AND MERRILL, ASSOCIATE PROFESSORS KEENAN AND KELLER (DIRECTOR), ASSISTANT PROFESSOR SLETTEBAK

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

***605. Introduction to Celestial Mechanics.** Three credit hours. Winter Quarter. General prerequisites must include elementary courses in physics and mathematics. Given in alternate years. Mr. Slettebak.

The application of the laws of motion to planets and stars. The two-, three- and n-body problems. Binary stars as applications of the two-body problem. Introductory discussion of orbit theory.

615. Observational Astronomy. Four credit hours. Autumn Quarter. Two class hours and one three-hour laboratory each week. General prerequisites must include elementary courses in astronomy and physics, and a course in calculus. Mr. Slettebak.

The basic observations in astronomical research with emphasis on classical positional astronomy. Spherical astronomy. Reduction and statistical analysis of observations. Introduction to astrometry.

651. Introduction to Astrophysics. Three credit hours. Spring Quarter. General prerequisites must include Physics 614 or its equivalent and a course in calculus. Mr. Slettebak, Mr. Keenan.

Introduction to the study of the physical properties of individual stars. Stellar atmospheres and interiors. The physics of interstellar matter.

Not open to students who have credit for Astronomy 701.

700. Minor Problems in Astronomy. One to fifteen credit hours. Any Quarter. Conference, library and laboratory work. General prerequisites must include ten Quarter-hours of Astronomy, one year of calculus and one year of sophomore physics. A student may repeat this course and may spend all or any part of his time on it during a Quarter. Perkins Observatory staff.

This course is designed to permit a properly qualified student to avail himself of the facilities of the Perkins and McMillin Observatories to work independently on a special problem in observational or theoretical astronomy. Students who have specialized interests in some branch of astronomy may elect this course to secure an opportunity for *independent reading and study* under the supervision of an instructor. Each problem selected is subject to the approval of the instructor.

751-752-753. Observational Techniques. Three credit hours. Autumn, Winter and Spring Quarters. General prerequisites must include Astronomy 651, Physics 607 and 718. Perkins Observatory Staff.

These courses are intended (1) to give the student an opportunity to work with actual laboratory and observatory equipment, (2) to acquaint him with some of the basic methods employed in the reduction of observations, and (3) to give him a feeling for the limitations and inherent errors of the observational techniques.

Design and use of visual and photographic telescopes. Reduction of visual double star observations. Mass-ratios. Parallax and proper motion.

Photometry. Colors, star counts. Photoelectric photometry. Observations of eclipsing binaries and their reduction. Cepheids.

Astronomical spectrographs and their uses. Measurement of spectral lines and bands and their identification. Radial Velocity determinations. Spectroscopic binaries. Spectrophotometry. Microwave receivers.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

* Not given in 1954-1955.

Prerequisites for Graduate Work: Graduate work in astronomy presupposes the satisfactory completion of approximately 90 Quarter hours of undergraduate work (or their equivalent) in mathematics, physics, and astronomy. A knowledge of advanced calculus, differential equations, and vector analysis is needed as well as a firm grounding in undergraduate thermodynamics, electricity, optics, and atomic theory. Training beyond a general undergraduate course in astronomy is valuable but not essential. If these requirements are not met at the time of admission, any deficiencies must be made up in excess of the regular requirements for the degree. Only students with high standing in their undergraduate work in mathematics, physics, and astronomy will be admitted to graduate work in astronomy.

Requirements for the Master's Degree: The program of work toward a Master's degree in astronomy would normally require the completion of Astronomy 753, 818, and approximately 27 additional hours of 700 or 800 courses in physics and astronomy. In all cases, it must provide an adequate foundation for further advanced work. (a) Each Quarter, prior to registration, a candidate for the Master's degree must plan his program with a member of the departmental Committee on Graduate Study. (b) Not later than two Quarters before the time at which the candidate expects to receive the Master's degree he must, after a conference with a member of the departmental Committee on Graduate Study, select the subject of his thesis and the instructor with whom he elects to work. (c) Each candidate for the Master's degree is required to pass a written examination on the elementary and intermediate principles of astronomy and physics. This examination must be taken before the completion of forty-five hours of work in astronomy, physics and mathematics.

Requirements for the Degree Doctor of Philosophy: The course of study to be pursued for the doctor's degree is arranged for each student by the departmental Committee on Graduate Study after consultation with the student and his adviser. Work in other departments may be recommended according to the needs of the individual student. In all cases, proper consideration must be given to the mastery of the broad fundamental principles necessary for productive scholarship. (a) A reading knowledge is required of any two of the three languages, French, German, and Russian, and students should meet this requirement as early as possible. (b) Not later than four Quarters before the student expects to receive the Ph.D. degree he must, after a conference with a member of the departmental Committee on Graduate Study, select the field of his dissertation and select the instructor under whose direction he elects to work. (c) Before being admitted to candidacy for the doctor's degree, the applicant is required to pass a written examination on astrophysics, observational astronomy, theoretical and celestial mechanics, physical optics and atomic physics, and mathematical methods in physics. These written examinations are followed by an oral examination as required by the Graduate School.

***801-*802-*803. Seminar in Astronomy.** One credit hour. One two-hour class meeting each week. Autumn, Winter, and Spring Quarters. General prerequisites must include ten Quarter-hours each in 600 courses or higher in astronomy, physics, and mathematics or permission of the instructor. This course is required of all candidates for advanced degree in astronomy. This course may be repeated for credit. All instructors.

Seminars will be conducted by various members of the Perkins and McMillin Observatory staffs on topics of current interest in their fields of specialization. Students will participate actively in the presentation and discussion of material.

811-812-813. Physics of Stars. Three credit hours each Quarter. Autumn, Winter, Spring. General prerequisites must include Astronomy 651, Physics 603, 604, 606, 718, Mathematics 601, 611. Mr. Keenan, Mr. Keller.

Direct estimation from stellar spectra of the physical properties of stars: luminosity, temperature, and composition.

Radiative and mechanical equilibrium. Solution of the equations of radiative transfer. Energy distribution in the continuous spectrum. Formation of absorption lines.

The theory of the internal structure of stars, with applications to typical stars of known masses, radii, and luminosities.

831-832-833. Advanced Astrophysics. Three credit hours each Quarter. Autumn, Winter, Spring. General prerequisites must include Astronomy 813. Mr. Keenan, Mr. Keller.

Shells of gas surrounding stars. The solar corona. Gaseous nebulae. Interstellar matter. Structure and atmosphere of planets. Satellites. Interplanetary bodies. Effects on the earth's atmosphere of radiation and particles from the sun.

Physically variable stars. Stellar evolution.

841-842-843. Dynamical Astronomy. Three credit hours each Quarter. Autumn, Winter, Spring. General prerequisites must include Astronomy 813. Mr. Keller.

* Not given in 1954-1955.

Statistics of stellar distribution and kinematics. Structure of the galaxy. External galaxies. Cosmology, cosmogony, and the natural abundance of the elements. Review of the available observational data and of the several theories currently under discussion.

†850. Current Topics in Astronomy. Three credit hours. Summer Quarter. With the permission of the staff this course may be repeated for credit. General prerequisites must include Astronomy 651. The Staff.

This course is designed to permit members of the staff and visiting lecturers to present material on the various fields of astronomy in which they are currently working.

950. Research in Astronomy and Astrophysics. Autumn, Winter and Spring Quarters. General prerequisites include acceptable courses in astronomy, mathematics, and physics. Subject of research must be chosen after consultation with the Director. The course may be repeated as often as necessary in pursuit of any special research. (See page 13 for research facilities offered by the Perkins Observatory.) Departmental staff.

PHYSIOLOGICAL CHEMISTRY AND PHARMACOLOGY

Office, 214 Hamilton Hall

PROFESSORS SMITH AND BROWN, ASSOCIATE PROFESSORS WIKOFF AND RUGGY, ASSISTANT PROFESSORS FRAJOLA AND DEVOR, MR. MARKS, MR. KRUGER, MISS CARSON, AND ASSISTANTS

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

These prerequisites include fundamental courses in general chemistry, qualitative and quantitative analysis and organic chemistry.

Courses 601, 602, 609, 610, and 671 are open only to students doubly registered in the College of Medicine and the Graduate School. Courses 682 and 683 are open only to students doubly registered in the College of Dentistry and the Graduate School. (See page 84.)

Requirements for the Master's Degree:

(a) The course requirements for the Master's degree are not rigidly fixed, but in addition to his major work the candidate must take courses in advanced organic chemistry.

(b) The candidate must give evidence of his ability to read biochemical papers in either French or German.

PHYSIOLOGICAL CHEMISTRY

601. Physiological Chemistry. Four credit hours. Autumn Quarter. Two lecture and two quiz hours each week. Physiological Chemistry 609 must be taken concurrently. Mr. Brown, Mr. Ruggy, Mr. Frajola, Mr. Devor.

The chemistry of carbohydrates, lipids, and proteins.

Not available for graduate credit for students majoring in physiological chemistry.

602. Physiological Chemistry. Four credit hours. Winter Quarter. Two lectures and two quiz hours each week. General prerequisites must include Physiological Chemistry 601. Mr. Brown, Mr. Ruggy, Mr. Frajola, Mr. Devor.

The chemistry of digestion, metabolism, and excretion.

Not available for graduate credit for students majoring in physiological chemistry.

609-610. Physiological Chemistry Laboratory. Two credit hours. Autumn and Winter Quarters. Six laboratory hours each week. Physiological Chemistry 601 must be included as a prerequisite or must be taken concurrently. Mr. Ruggy, Mr. Mark, Mr. Devor, Mr. Kruger.

Laboratory work demonstrating the properties of fats, carbohydrates and proteins during the Autumn Quarter. In the Winter Quarter experiments concerning the chemistry of digestion, metabolism and excretion together with a consideration of the chemistry of the tissues.

611. Physiological Chemistry. Five credit hours. Autumn Quarter. Three

† Not given during the academic year, 1954-1955.

* Not given in 1954-1955.

lecture-quiz hours and six laboratory hours each week. General prerequisites must include quantitative analysis and Chemistry 647, 648, 649, 650. Miss Wikoff, Mr. Kruger.

The chemistry of carbohydrates, lipids, and proteins.

Not open to students who have credit for Physiological Chemistry 601. Not available for graduate credit for students majoring in physiological chemistry.

612. Physiological Chemistry. Five credit hours. Winter Quarter. Three lecture-quiz hours and six laboratory hours each week. General prerequisites must include Physiological Chemistry 611. Miss Wikoff.

The chemistry of digestion, metabolism, and excretion.

Not open to students who have credit for Physiological Chemistry 602. Not available for graduate credit for students majoring in physiological chemistry.

613. Quantitative Methods of Blood Analysis. Three credit hours. Spring Quarter. One lecture and six laboratory hours each week. General prerequisites must include Physiological Chemistry 602 or 612. Miss Wikoff, Miss Carson.

Determination of important constituents of the blood.

614. Biochemical Methods of Analysis (Food Analysis). Five credit hours. Winter Quarter. Two hours of lecture or quiz and nine laboratory hours each week. General prerequisites must include Physiological Chemistry 611. Miss Wikoff, Miss Carson.

The quantitative analysis of the proteins, fats, and carbohydrates. Special methods for the analysis of biological materials.

618. Toxicology and Legal Medicine. Two or four credit hours. Autumn Quarter. Two lectures and six laboratory hours each week. For four credit hours, general prerequisites must include acceptable courses in quantitative analysis and organic chemistry. Mr. Smith, Miss Carson.

A course dealing with that portion of medical knowledge which may be of assistance in serving the needs of law and justice including the effects and detection of poison.

619. Minor Problems in Physiological Chemistry. Two to fifteen credit hours. Autumn, Winter, and Spring Quarters. General prerequisites must include Physiological Chemistry 614. A student may repeat this course and may spend all or part of his time on it during a Quarter. Mr. Smith, Mr. Brown, Miss Wikoff, Mr. Devor, Mr. Frajola.

This course is designed to permit any properly qualified person to avail himself of the facilities of the department for carrying out a minor investigation or for adding to his knowledge and technique in physiological chemistry. A student may exercise complete freedom in his choice of instructor to direct his work in this course.

632. Physiological Chemistry. Six credit hours. Spring Quarter. Four lecture or quiz hours and six laboratory hours each week. Mr. Brown, Mr. Devor, Mr. Frajola.

The chemistry of the carbohydrates, lipids, and proteins; together with the chemistry of digestion, absorption, metabolism, and excretion; the tissues; the internal secretions.

633. Physiological Chemistry. Two credit hours. Autumn Quarter. One lecture and one quiz hour each week. General prerequisites must include Physiological Chemistry 632. Mr. Brown, Mr. Devor.

The elements of human nutrition; the effects of diets on the human body; the relation of diets to dentistry.

715. Biochemical Biography. One credit hour. Spring Quarter. General prerequisites must include Physiological Chemistry 612. Required of all candidates for graduate degrees in physiological chemistry. Miss Wikoff.

PHARMACOLOGY

671. Pharmacology. Four credit hours. Spring Quarter. Three lecture or quiz hours and three laboratory hours each week. General prerequisites must include Physiology 634, 635, 636 and Physiological Chemistry 601, 602. Mr. Smith, Mr. Ruggy, Mr. Engelman, Mr. Marks.

This course treats of the modification of the normal physiological processes of the body by the presence of the more common drugs used in medicine.

This course is open to students in the College of Medicine only.

672. Pharmacology. Two credit hours. Winter Quarter. Two lecture or conference hours each week. General prerequisites must include Pharmacology 670. Mr. Ruggy, Mr. Marks.

A continuation of the material presented in Pharmacology 670 with special emphasis on chemotherapy and toxicology.

This course is open to students in the College of Medicine only.

675. Methods of Biologic Drug Assay. Three credit hours. Winter Quarter. Two lectures and one three-hour laboratory period each week. General prerequisites must include fundamental courses in biology and chemistry in addition to permission of the instructor. Mr. Marks.

This course includes consideration of the methods in common use for the biological standardization of drugs.

676. Minor Problems in Materia Medica and Pharmacology. Two to fifteen credit hours. Autumn, Winter, and Spring Quarters. General prerequisites must include acceptable courses in chemistry or pharmacology. A student may repeat this course and may spend all or part of his time on it during a Quarter. Mr. Smith, Mr. Ruggy, Mr. Marks.

This course is designed to permit any properly qualified person to avail himself of the facilities of the department for carrying out a minor investigation or for adding to his knowledge and technique in materia medica or pharmacology. A student may exercise complete freedom in his choice of instructor to direct his work in this course.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

PHYSIOLOGICAL CHEMISTRY

812. Seminar in Physiological Chemistry. Two credit hours. Winter Quarter. Two lectures each week. General prerequisites must include Physiological Chemistry 602 or 612 or their equivalent.

Topic for 1955: To be announced.

813. Seminar in Physiological Chemistry. Two credit hours. Spring Quarter. Two lectures each week. General prerequisites must include permission of the instructor. Mr. Devor.

Topic for 1955: To be announced.

821. Advanced Physiological Chemistry. Three credit hours. Autumn Quarter. Three lectures each week. General prerequisites must include Physiological Chemistry 602 or 612, and Chemistry 841, 842, 843. Miss Wikoff.

A graduate course covering the chemistry of the carbohydrates, proteins, and sterides.

822. Advanced Physiological Chemistry. Three credit hours. Winter Quarter. Three lectures each week. General prerequisites must include Physiological Chemistry 602 or 612 and Chemistry 841, 842, 843. Mr. Brown, Mr. Devor.

An advanced course covering the chemistry of the lipids, tissues, body fluids, enzymes, and vitamins.

823. Advanced Physiological Chemistry. Three credit hours. Spring Quarter. Three lectures each week. General prerequisites must include Physiological Chemistry 821, 822 and 602 or 612. Mr. Kruger.

A graduate course covering the chemistry of metabolism, pigments, and hormones.

825-826. Advanced Physiological Chemistry Laboratory. Three credit hours. Autumn and Winter Quarters. Nine hours of library, conference and laboratory work each week. Physiological Chemistry 821 and 822 must be included in the general prerequisites or taken concurrently. Mr. Devor.

Advanced courses in biological preparation including the isolation of enzymes, carbohydrates, lipids, proteins and such hormones as epinephrin and insulin.

830. Chemistry of Medicinal Substances. Three credit hours. Winter Quarter. Three conference hours each week. General prerequisites must include Physiological Chemistry 611, 612, or Chemistry 841 and 842. Mr. Smith.

898. Interdepartmental Seminar in Nutrition and Food Technology. One credit hour. Spring Quarter. In cooperation between the Institute of Nutrition and Food Technology and the several departments interested, a seminar will be conducted in nutrition and in the related field of food technology. Subject and staff will be announced each year after approval by the Graduate School.

PHARMACOLOGY

850. Experimental Pharmacodynamics. Five credit hours. Autumn Quarter. Three conference or lecture hours and six laboratory hours each week. General prerequisites must include acceptable courses in physiology and chemistry including Physiological Chemistry 602 or 612. Mr. Smith.

This course deals with the actions of drugs on the normal physiological processes, apart from therapeutics, and with some of the theories which seek to explain these actions.

RESEARCH

950. Research in Physiological Chemistry and Pharmacology. Autumn, Winter, and Spring Quarters. Research in Physiological Chemistry will be conducted under the guidance of Mr. Smith, Mr. Brown, Miss Wikoff; research in Pharmacology under the guidance of Mr. Smith, Mr. Ruggy.

PHYSIOLOGICAL OPTICS

(See under Optometry)

PHYSIOLOGY

Office, 312 Hamilton Hall

PROFESSORS OGDEN, BOZLER, HARTMAN (RESEARCH), HITCHCOCK AND MYERS (RESEARCH), ASSOCIATE PROFESSORS ANGERER, BEMAN, GRUBBS, AND SAPIRSTEIN; ASSISTANT PROFESSORS BROWNELL, BUCKLEY, COULTER, HULL, LESSLER AND STACY

Prerequisites: Graduate students majoring in physiology are required to have completed Chemistry 649 and 650 (5 hours) or equivalent; general physics (15 hours); biological sciences (20 hours, to include comparative anatomy). Physical chemistry, calculus and statistics (Zoology 630) are recommended.

Requirements for the Master's Degree: In addition to the general requirements in regard to thesis and final examination (pages 38-41) the adviser will see that the program contains acceptable courses in physiology and related sciences such as the following or their equivalents: anatomy (5 neuro and 5 histology), 10 hours; physiological chemistry or biochemistry, 10 hours; statistics, 5 hours; advanced physiology; physiology seminar; advanced physiology laboratory (625) 5 hours; advanced physiology (800 series), 9 hours; research, 701, 950. Many of these courses may be completed as undergraduates.

Requirements for the degree Doctor of Philosophy: (See general requirements, page 45). In addition to the Master's recommendations above, further course work in physiology or closely related subjects is recommended, including 815, 816, and 817 each Quarter, additional 15 hours of advanced physiology, (beyond recommendations for Master's Degree), calculus.

For further information: Student should apply to the department office for a mimeographed sheet of the department's current recommendations.

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

601. Advanced Mammalian Physiology. Five credit hours. One Quarter. Summer and Winter. Four lectures and one three-hour laboratory period each week. General prerequisites must include inorganic and organic chemistry, one year of college physics, and one year of biological science or permission of department chairman. Summer Quarter, staff; Winter Quarter, staff.

Advanced physiology of muscle, nerve, central nervous system, special senses, digestion, and circulation.

602. Advanced Mammalian Physiology. Five credit hours. One Quarter. Autumn and Spring. Four lectures and one three-hour laboratory period each week. General prerequisites must include inorganic and organic chemistry, one year college physics, and one year biological science or permission of the department chairman. Autumn Quarter, staff; Spring Quarter, staff.

Advanced physiology of body fluids and excretion, respiration, digestion and metabolism, and endocrines.

604. Advanced Physiology. Six credit hours. Autumn Quarter. Four lecture or recitation hours and six laboratory hours each week. Open only to students registered in the College of Dentistry. Mr. Hitchcock, Miss Brownell, Mr. Coulter, Mr. Lessler and staff.

The course covers the neuromuscular system, the central nervous system, special senses and body fluids.

Open only to students registered in the College of Dentistry.

605. Advanced Physiology. Six credit hours. Winter Quarter. Four lecture or recitation hours and six laboratory hours each week. Open only to students registered in the College of Dentistry. General prerequisites must include Physiology 604 or equivalent. Mr. Hitchcock, Miss Brownell, Mr. Coulter, Mr. Lessler and staff.

The course covers the cardiovascular system, respiration, digestion, metabolism, excretion, the endocrines, and reproduction.

Open only to students registered in the College of Dentistry.

625. Advanced Mammalian Physiology (Laboratory). Five credit hours. Spring Quarter. Two lectures and three three-hour laboratory periods each week. General prerequisites must include permission of the department chairman. Department staff.

An advanced course in the physiology of the mammal, based largely on laboratory experiments.

628. Physico-Chemical (General) Physiology. Five credit hours. Autumn Quarter. Four lectures and recitation hours and three laboratory hours each week. General prerequisites must include elementary physiology or its equivalent, general zoology, general physics or its equivalent, and permission of the instructor. Mr. Angerer and staff.

Analyses of similarity among protoplasmic systems interpreted on known physical and chemical concepts and principles; where pertinent, the comparative viewpoint is considered. The discussions include: cellular particulates, submicroscopic structure, colloid chemistry, and physical properties of protoplasm; biological membranes and their permeability; bioelectric potentials; excitability and its propagation; protoplasmic, muscular, amoeboid and ciliary movements.

***630. Endocrinology.** Five credit hours. Spring Quarter. Four lectures and three laboratory hours each week. General prerequisites must include Physiology 601 and 602, or permission of the instructor. Mr. Hartman, Miss Brownell and staff.

A study of the functions of the thyroid, parathyroid, pituitary, adrenal, pancreas, gonads, and other organs with possible endocrine function.

638. Physiology of the Special Senses. Three credit hours. Spring Quarter. Three lectures each week. General prerequisites must include elementary physiology or equivalent, Psychology 605 and 606 or equivalent, or Physiological Optics 613 or equivalent. Mr. Ratoosh and staff.

* Not given in 1954-1955.

A survey of the basic physiology of the senses, including smell, taste, and hearing, with emphasis on the photochemical and neural basis of vision.

639. Physiology of the Special Senses. Laboratory. Two credit hours. Spring Quarter. Six laboratory hours each week. Registration only by permission of the instructor.

An informal course. After a few basic experiments the students will choose special problems for investigation.

645. Biophysics (Classical). Five credit hours. Spring Quarter. Four lectures and one three-hour laboratory period each week. General prerequisites must include one year of college physics, and elementary physiology or its equivalent. Mr. Stacy and staff.

This course is a study of physical systems in relation to biological phenomena, with specific illustrations in the application of mechanics, heat, light, sound, electricity, hydraulics, etc. The course is designed for the biology student who will not become a professional biophysicist.

646. Biophysics (Radiation). Three credit hours. Winter Quarter. Two lectures and a two-hour demonstration or laboratory period each week. General prerequisites must include two years of college chemistry and one year each of college physics and biology. Mr. Myers and staff.

Methods and techniques for applications of stable and radioactive isotopes in biology.

648. Physical Instrumentation for Biologists. Three credit hours. Spring Quarter. One lecture and two three-hour laboratory periods each week. General prerequisites must include one year of college physics and elementary physiology or its equivalent and satisfactory course work in physical chemistry. Mr. Stacy and staff.

This course covers the theory and practical application of physical instruments used in biological studies, including elementary electronics. The student handles and learns to use stimulators, amplifiers, cathode ray oscilloscopes, recorders, and other electrical, optical, and mechanical instruments.

701. Minor Problems. One to fifteen credit hours. Autumn, Winter, and Spring Quarters. General prerequisites must include permission of the department chairman. Department staff.

Reading, conferences, laboratory work by individual arrangement with qualified students who desire more intensive and specialized study than is available in other courses.

†715. Seminar in Physiology. One or two credit hours. Summer Quarter only. General prerequisites must include permission of the department chairman or graduate adviser. Department staff.

A seminar course in physiology involving joint participations by students and staff.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

807. Advanced Studies in Physiology. Three to five credit hours. General prerequisites must include Physiology 601 and 602 or equivalent.

The student will select or be assigned special topics in one of the following fields of Physiology.

- * (a) Neuromuscular System. Dr. Bozler, Dr. Coulter.
- * (b) Cardiovascular and Renal Physiology. Dr. Ogden, Dr. Sapirstein.
- * (c) Aviation Physiology. Dr. Hitchcock.
- (d) Digestion and Metabolism. Dr. Grubbs, Dr. Beman. Summer Quarter.
- (e) Physico-Chemical (General) Physiology. Dr. Angerer, Dr. Lessler. Winter Quarter.
- (f) Biophysics. Dr. Myers, Dr. Stacy. Autumn Quarter.
- (g) Endocrinology. Dr. Hartman, Dr. Brownell. Spring Quarter.
- * (h) Respiration. Dr. Hitchcock.

815-816-817. Seminar in Physiology. Two credit hours. Autumn, Winter, and Spring Quarters. General prerequisites must include permission of department chairman. Department staff.

* Not given in 1954-1955.

† Not given during the academic year, 1954-1955.

950. Research in Physiology. Autumn, Winter, and Spring Quarters. General prerequisites must include permission of the department chairman. Department staff.

The department is prepared to supervise research in animal physiology.

POLITICAL ECONOMY

(See Economics and Sociology)

POLITICAL SCIENCE

Office, 106 University Hall

PROFESSORS MANSFIELD, SPENCER (EMERITUS), WALKER, HELMS, AUMANN, ZINK, AND HEIMBERGER, ASSOCIATE PROFESSORS HECKMAN, NEMZER, SPITZ, AND KAWAI, ASSISTANT PROFESSORS JAFFA AND COOK, MR. BRAZIER AND MR. MILLER

Departmental Committee on Graduate Work: General supervision of all phases of the graduate program (including the curriculum, admission to candidacy for the Master's degree, and the approval of a candidate's qualifications to take the general examination for the Ph.D. and of his dissertation subject) is exercised by a graduate committee of the Department. Each candidate for graduate work in political science or public administration shall submit to the chairman of the department for the graduate committee a statement of educational background, interests, and aims.

Each graduate student enrolled in political science or public administration is placed under the immediate supervision of an advisory committee of three or more persons representing the departments in which the student is taking a substantial amount of work, at least two of whom are members of the department of political science. Each advisory committee is named by the graduate committee (which designates one of the number as chairman) and reports periodically to the graduate committee on the progress of the student. The student will consult each member of his advisory committee at intervals concerning his program of study and in the preparation of his thesis or dissertation. In the case of the Master's degree, final approval of the thesis rests with the advisory committee whose members normally constitute also the oral examining committee.

Candidates for the degree of Master of Arts will be expected to include some courses in the "700" and "800" groups in their study programs, and may not ordinarily enroll for 950 credit until they have completed 80 credit hours in other course work. They should elect 781 at the earliest opportunity. Unless a student is unusually well prepared, he should not expect to secure this degree in less than four Quarters, and should complete at least 45 hours of course work in addition to the thesis.

Requirements for the Degree of Doctor of Philosophy: The Department of Political Science offers the following fields of concentration:

1. Political Theory and Jurisprudence.
2. Foreign Governments and Comparative Political Institutions.
3. American Government and Politics.
4. State and Local Government in combination with 3 or 5 or 7.
5. Public Opinion, Parties, and Pressure Groups.
6. Public Administration.
7. Public Law.
8. International Law and Relations.

A candidate must satisfy the language, residence and dissertation requirements of the University. Beyond these he is expected to show both aptitude for research in a particular field and a broad grasp of information and concepts in political science, as well as some acquaintance with relevant aspects of allied disciplines, and facility in expression in English. Early in his graduate study he is required to pass a preliminary examination to demonstrate his fitness in these respects; the Master's examination may serve this purpose in the case of a student taking a Master's degree here with the expectation of going on to the Ph.D.

An advisory committee is appointed for each candidate to aid in arranging his program and in carrying it to completion. The selection and sequence of courses to be taken in and outside the Department depend on the student's previous training and objectives. He should take Political Science 781 at the earliest opportunity and at least 35 hours of his work for residence credit should be in courses in the 700 and 800 groups. The oral portion of the examina-

tion will cover his field of concentration and two other fields designated by his advisory committee. Both branches of the general examination are addressed to his mastery of the field as fields, and are not limited to the courses taken.

Master of Science in Public Administration. See page 314.

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51. Specific course prerequisites are stated in the Bulletin of the College of Arts and Sciences. These courses may not ordinarily be counted for credit toward a graduate degree in Political Science unless the prerequisites have been satisfied.

Majors in economics, education, geography, history, journalism, philosophy, social administration, and sociology may be admitted to these courses without the political science prerequisites.

605. Principles of Public Administration I. Five credit hours. Autumn Quarter. Mr. Mansfield, Mr. Walker.

Basic problems of public administration: ends and means; the formulation of policy; organization and management; working methods of control; coordination and responsibility.

606. Principles of Public Administration II. Five credit hours. Winter Quarter. Four lecture and discussion sessions and one field interview each week. Mr. Walker.

An examination of the principles of public administration as applied to the rendering of services to the public by national, state and local governments: the protection of life and property, the promotion of trade and commerce, the regulation and operation of public utilities, city and metropolitan planning, and the furtherance of public welfare, noting in each case the part which is played by each of the levels of government. The field work in this course will require personal interviews with public officers and weekly papers based upon them.

607. American Municipal Government. Five credit hours. Autumn Quarter. Mr. Walker, Mr. Brazier.

A comparative study of modern municipalities in the United States; their social significance; their governmental structure; their relation to the state; the experience with government by council, mayor, commission, and manager; methods of popular participation.

Not open to students who have credit for Political Science 500 or 595.

611. Introduction to Jurisprudence. Five credit hours. Autumn Quarter. Mr. Aumann.

An introductory study of legal concepts. An attempt is made both to give the prospective law student an analytical and historical guide into his subject, and to give those who do not intend to pursue the study of law an idea of its significance in social organization, and its relation to political and economic science.

†612. International Law. Five credit hours. Autumn Quarter.

A study of the principles of international law, including analysis of theories concerning its nature and fundamental conceptions, from the Seventeenth Century to the present; its relation to national law; problems of international legislation and codification. Materials include court decisions, tactics and conventions, and analogous materials.

613. Contemporary International Politics. Five credit hours. One Quarter. Autumn and Spring. Mr. Helms.

A study of the political relations among sovereign states; methods and goals of diplomacy; current problems in major areas of tension; tendencies toward administrative, judicial, and legislative world-organization.

614. Public Personnel Administration. Three credit hours. Winter Quarter. General prerequisites must include Political Science 605. Mr. Walker.

The organization, purposes and activities of civil service agencies; recruitment policies and procedures; classification and compensation plans; efficiency measurements and rewards; training programs; morale, discipline, and civil rights of public employees; promotion, transfer, retirement, and other personnel processes.

615. Administration of Justice. Five credit hours. Winter Quarter. Mr. Aumann.

A study of the nature, purposes, and limitations of law as administered through courts. The development, organization, and procedure of our judicial system. Recent trends in legal thinking.

† Not given during the academic year, 1954-1955.

616. American Constitutional Law. Five credit hours. One Quarter. Autumn and Spring. Mr. Aumann.

A study of leading constitutional principles in the United States as interpreted by the courts. Special studies will be made of such topics as the following: the adoption and amendment of constitutions; the judicial power; citizenship; private rights; powers of Congress; war powers; police powers of the states; political privileges. Designed for students who desire a non-technical knowledge of the more important federal and state constitutional principles in the United States.

Not open to students who have credit for more than one of the following: Political Science 641, 642, 643.

618. The National Government and the National Economy. Three credit hours. Spring Quarter. Mr. Mansfield.

A study of the interaction of economic and political power, illustrated in the major contemporary issues of national affairs.

621. Ancient and Medieval Political Thought. Three credit hours. Autumn Quarter. Mr. Jaffa.

The origins and subject matter of political philosophy. The chief theories of law and government, of the nature and forms of state, of freedom and obedience, from the Greek city-state to the Renaissance. Plato, Aristotle, Cicero, Augustine, Thomas Aquinas, Dante, and others. Political Science 621, 622, and 623 are intended to present consecutively the development of Western political philosophy.

622. Modern Political Thought. Three credit hours. Winter Quarter. Mr. Jaffa.

A study of the major political philosophers from the Renaissance to the Nineteenth Century. Machiavelli, Hobbes, Locke, Montesquieu, Rousseau, Burke, Hegel.

623. Contemporary Political Thought. Three credit hours. Spring Quarter. Mr. Spitz.

An examination of the more important contemporary ideas on the nature of the state, of government, and of law. The doctrines of anarchism, communism, fascism, socialism, syndicalism, and democracy. Theories of power and the relation of the state to the social order.

624. American Political Ideas. Three credit hours. Winter Quarter. Three lecture and discussion periods each week. Mr. Spitz.

An analysis of American ideas on law and government, authority and liberty, oligarchy and democracy, from the Puritans to the present day.

625. Great Britain and the British Commonwealth. Five credit hours. Autumn Quarter. Mr. Zink.

A general study of the government of Great Britain and of the Commonwealth of Nations as an association of self-governing states.

627. Latin American Government and Politics. Five credit hours. Spring Quarter. Mr. Walker.

A study of the political conditions and practices of the states of South and Central America. The results on state organization and operation of the special geographical and historical conditions of this region, as regards written constitutions, representative institutions, and the developing administrative hierarchies. The influence of the United States, and tendencies for and against cooperation among the states of the hemisphere.

628. Governments of Western Europe. Five credit hours. Winter Quarter. Mr. Zink.

A study of political institutions in West Germany, France, and one or more of the small states of Western Europe. Emphasis on the constitutional basis, governmental structure, political parties, and problems of postwar reconstruction.

633. Legislation. Three credit hours. Spring Quarter. Mr. Walker.

The process of law making in the United States, the constituent process, statute law making, legislative drafting, legislative procedure, judicial review, the common law, executive ordinances, popular law making.

634. Public Opinion and Political Processes. Five credit hours. Winter Quarter. Mr. Heckman.

Nature and measurement of public opinion and its effect on political processes; genesis of political attitudes; propaganda of pressure groups; government propaganda in peace and war; political influence of social institutions, including press, radio, and movies. Lectures, discussion, and report.

635. American Political Parties and Pressure Groups. Five credit hours. One Quarter. Autumn and Winter. Mr. Helms.

An analysis of the organization, programs and campaign methods of political parties and of such pressure groups as labor, business, agriculture, etc. Methods of nomination, suffrage qualifications, campaign finance, government regulation of parties and pressure groups and the conduct of elections.

636. The Soviet Union and its Satellites. Five credit hours. Autumn Quarter. Mr. Nemzer.

A general study of the Soviet Union and its neighboring dependent states; governmental and party institutions; ideology and methods; problems of communist dictatorship.

637. Soviet Foreign Policy. Five credit hours. Winter Quarter. Mr. Nemzer.

The Soviet outlook abroad; basic factors and choices in Soviet foreign policy; Soviet diplomacy and the Cominform; the Soviet sphere of influence; the technique of infiltration; the USSR and the UN; the USSR and the U.S.

Not open to students who have credit for Political Science 629.

640. The United States in World Affairs. Five credit hours. Spring Quarter. Mr. Nemzer, Mr. Mansfield.

An examination of agencies and procedures in the formulation and execution of contemporary American foreign policy, followed by an intensive study of American policy in the United Nations, and concerning the USSR and Western Europe.

649. International Relations of the Far East. Five credit hours. Autumn Quarter. Mr. Kawai.

Early impact of the Occident upon the Far East; relations between Russia, Japan and China; opening of the Far East in the Nineteenth Century; period of wars and unsettlement; international rivalries in China. The Open Door Policy; the Russo-Japanese War; the Chinese Revolution; the effects of World War I and the Russian Revolution; Japanese imperialism. World War II and its aftermath.

650. The Governments and Politics of the Far East. Five credit hours. Winter Quarter. Mr. Kawai.

Governmental institutions of China, imperial, republican, and Communist. Constitutionalism vs. militarism, occupation reforms, and contemporary politics in Japan. The governments of nearby East Asian countries.

651. Southeast Asia. Three credit hours. Spring Quarter. Mr. Kawai.

The governments and politics of the Philippines, Indonesia, Indo-China, Malaya, Thailand and Burma; and the basic factors underlying the contemporary problems of the Southeast Asiatic region in relation to world politics.

701. Minor Problems. One to five credit hours. Autumn, Winter, and Spring Quarters. Informal conferences, the intent being to allow full scope to the initiative of the student. Department staff.

A special topic is assigned to each student and results are tested by papers and special examinations.

***714. International Organization and Administration.** Three credit hours. Autumn Quarter. Given in alternate years. Mr. Nemzer.

An examination of the current system of international organization and its administrative aspects, with emphasis on the operations of the United Nations agencies.

720. Comparative Public Administration. Three to five credit hours. Winter Quarter. General prerequisites must include 605 and 625 or 628, or equivalent. Mr. Walker.

An examination of the organization and functioning of administrative agencies abroad as compared with those in the United States. Seminar discussions supplemented by written reports on assigned topics. A reading knowledge of the language of the country selected for study is desirable.

***730. Administrative Law.** Three credit hours. Winter Quarter. General prerequisites must include Political Science 605, 606 or the equivalent. Mr. Mansfield.

* Not given in 1954-1955.

A study of the processes and powers of administrative agencies, the limits upon administrative discretion, the procedure before administrative tribunals, and the methods and scope of judicial relief from administrative action.

731. Methods of Governmental Research. Three credit hours. Autumn Quarter. General prerequisites must include fifteen hours in political science. Mr. Mansfield.

The materials of political science; history of procedure in political science research; research technique; presentation of results of research.

732. Non-rational Factors in Politics. Three credit hours. Spring Quarter. General prerequisites must include Political Science 634 and 635, or in the case of advanced students in other departments, the consent of the instructor. Mr. Heckman.

A consideration of the role of myth, personality, tradition, and sentiment as conditioning factors in the political process.

735. Contemporary Political Problems. Three to five credit hours. Autumn, Winter, and Spring Quarters. General prerequisites must include fifteen hours in political science. Senior staff.

Under this course number senior members of the department will conduct advanced studies of significant topics of current national concern that can be treated only briefly, if at all, in the elementary courses.

Topics for 1954-1955: Autumn Quarter: To be announced; Winter Quarter: Anti-Americanism in Asia. Mr. Kawai; Spring Quarter: To be announced. Mr. Zink.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51. Specific course prerequisites are stated in the listings below. A general foundation in undergraduate courses in history and the social sciences is assumed. Any of the 800 level courses listed below may be repeated for credit provided that no student shall earn more than ten hours of credit in any single course.

805. Political Thought. Three to five credit hours per Quarter. Autumn and Spring Quarters. General prerequisites must include previous course work in political thought, or in the case of advanced students in related departments, the consent of the instructor. Mr. Spitz, Mr. Jaffa.

Seminar in the history of political ideas and in the theoretical problems of contemporary politics.

(A) Classical Theory. Spring Quarter. Mr. Jaffa.

(B) Contemporary Theory. Autumn Quarter. Mr. Spitz.

806. Comparative Government. Three to five credit hours. Winter Quarter. General prerequisites must include Political Science 628 and at least one of the following, or equivalent: Political Science 625, 627, 636, 650. Mr. Zink.

Seminar in the governments of foreign countries.

807. Public Opinion and Political Parties. Three to five credit hours. Autumn Quarter. General prerequisites must include two of the following, or equivalent: Political Science 634, 635, 732. Mr. Helms.

Seminar in the informal phases of politics. Special attention will be given to individual projects dealing with pressure groups, political party organization and procedure, and other aspects of the governmental process.

808. Public Administration. Three to five credit hours. Winter Quarter. General prerequisites must include at least two of the following, or equivalent: Political Science 605, 606, 614, 618, 720. Mr. Mansfield, Mr. Walker.

Seminar in staff and line activities of national, state, and local government.

809. Municipal Government. Three to five credit hours. Spring Quarter. General prerequisites must include Political Science 606, 607 (or 500) and 635. Mr. Walker.

Seminar in the municipal governments of the United States and Europe.

* Not given in 1954-1955.

810. International Relations. Three to five credit hours. Winter Quarter. General prerequisites must include Political Science 714 or 640 or 649. Mr. Nemzer.

Seminar in international relations.

811. Public Law. Three to five credit hours. Spring Quarter. General prerequisites must include Political Science 615 and 716 or 730. Mr. Aumann. Seminar in the field of public law, including special problems in the fields of constitutional law or judicial administration.

812. Legislation. Three to five credit hours. Autumn Quarter. Given in alternate years. General prerequisites must include Political Science 605, 616, and 633. Mr. Walker.

Seminar in the legislative process as exemplified by Congress, the state legislature, and city councils.

815. Bases of Conflicts in the Contemporary Far East. Three to five credit hours. Spring Quarter. General prerequisites must include Political Science 613, 640, and 649, 650 or 651. Mr. Kawai.

Investigations of the psychological, social, economic, and political bases of conflicts between Japan, China, and the Soviet Union.

***816. Soviet Politics.** Three to five credit hours. Spring Quarter. General prerequisites must include one course in Soviet affairs. Mr. Nemzer.

Seminar in problems of Soviet politics at home and abroad.

899. Interdepartmental Seminar. One to five credit hours. All Quarters. When two or more departments desire to establish an interdepartmental seminar on a subject of common interest, the chairmen or authorized representatives of the departments concerned shall prepare a course description including the names of faculty members designated to conduct the seminar. The statement shall be submitted to the Executive Committee of the Graduate School for prior approval.

950. Research in Political Science. Autumn, Winter, and Spring Quarters. General prerequisites must include six Quarter-courses in political science.

This course presents an opportunity for advanced research in political science, in such portion of the field as may be agreed upon with the individual student. It is offered in every Quarter, and with any of the members of the department in residence.

POULTRY SCIENCE

Poultry Administration Building

PROFESSORS DAKAN, WINTER, JAAP, AND CRAY, ASSOCIATE PROFESSOR YACOWITZ

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

601. Poultry Nutrition. Three credit hours. Autumn Quarter. One lecture and two two-hour laboratory periods each week. Mr. Yacowitz.

Experimental techniques for determining the nutritive requirements of poultry. Biological analysis of feedstuffs for poultry.

603. Marketing Poultry Products. Three credit hours. Winter Quarter. Three recitations each week. General prerequisites must include ten hours of economics. Mr. Cray.

Functions of marketing agencies and relation to marketing costs. Types and location of markets with respect to production. Functions of storage, market reporting and marketing controls. Marketing poultry products as related to the consumer.

606. Poultry Genetics. Five credit hours. Winter Quarter. Five lecture-conference periods each week. General prerequisites must include a course in heredity. Mr. Jaap.

* Not given in 1954-1955.

Genetic variation in body, growth, reproduction, and the egg quality. Breeding methods used in poultry production.

610. Hatchery Management. Three credit hours. Winter Quarter. Three lecture-conference periods each week. General prerequisites must include ten hours of economics. Mr. Cray.

Hatchery equipment, egg supply, flock improvement programs, sanitation, operation of incubators, chick sexing and hatchery management. Chick prices and hatchery costs; methods of selling chicks.

615. Poultry Plant Management. Five credit hours. Autumn Quarter. Five lecture-conference periods each week. General prerequisites must include ten hours of economics. Mr. Cray.

Considerations involved in establishing a poultry enterprise. Economic and management factors involved in the operation of specialized poultry breeding, egg and meat farms.

618. Processing Poultry Products. Three credit hours. One Quarter. Autumn and Spring. One lecture and two two-hour laboratory periods each week. General prerequisites must include fifteen hours of chemistry and fifteen hours of biological science including bacteriology. Mr. Winter.

Preparation of egg and poultry meat products, including grading, inspection, packaging and preservation of quality. Utilization of inedible poultry by-products.

Not open to students who have credit for Poultry Science 518.

701. Special Problems in Poultry Science. Two to five credit hours. Autumn, Winter and Spring Quarters. Mr. Dakan, Mr. Winter, Mr. Jaap, Mr. Cray, Mr. Yacowitz.

Limited to advanced students and must be arranged with the instructor in charge. Each student will be required to make an exhaustive study of some particular phase of poultry husbandry and write a thesis of his study and research. The work must comprise in part some original investigation by the student.

750. Poultry Seminar. One credit hour. Autumn, Winter, and Spring Quarters. All instructors.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

898. Interdepartmental Seminar in Nutrition and Food Technology. One credit hour. Spring Quarter. In cooperation between the Institute of Nutrition and Food Technology and those instructional departments who are interested, a seminar will be conducted in nutrition and in the related field of food technology. Subject and staff to be announced each year after the approval of Graduate School.

950. Research in Poultry Husbandry. Autumn, Winter, and Spring Quarters. Library, conference, and laboratory work. General prerequisites must include acceptable courses in the chosen field of research. The student may spend a part or all of his time on research work. Mr. Dakan, Mr. Winter, Mr. Jaap, Mr. Cray.

Research may be done in genetics, physiology, metabolism, nutrition, processing, food technology, economics, management, and marketing.

PREVENTIVE MEDICINE

(Public Health, Nutrition, Industrial Hygiene)
Office, Kinsman Hall

ASSOCIATE PROFESSOR PRIOR AND STAFF

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

753. Principles of Public Health Administration. Two to five credit hours. All Quarters. Mr. Goodloe and staff.

Administrative, organization, and function of public health agencies. Principles of sanitation, food inspection, immunization, and school health will be studied.

755. Seminar in Preventive Medicine. One to three credit hours. All Quarters. Elective in the College of Medicine and open for credit to graduate students in nutrition. The Staff.

Selected case studies in Preventive Medicine with special reference to environmental, social and economic factors in disease.

760. Nutrition in Systemic Disease. Three credit hours. Autumn Quarter. General prerequisites must include senior standing in Medicine or graduate standing in nutrition. Mrs. Lewis and Medical Staff.

The physio-pathological background of systemic disease and the rationale of specific diets in their prevention and treatment. Lectures, current literature reviews and case presentations.

Required in graduate curriculum of Dietetic Internes. Elective Medicine fourth year and properly qualified graduate students in Hospital Dietetics or Nutrition.

761. Community Nutrition. Three credit hours. Summer Quarter. General prerequisites must include senior standing in Medicine or graduate standing in Nutrition. Miss Scobie.

Methods of discovering problems of public health nutrition and the practical application of the findings in an attempt to improve nutritional status at various age levels. A study of techniques, direct and indirect service, clinic procedures, interviewing, budgeting, and use of educational materials.

PSYCHIATRY

Office, 059 Columbus Receiving Hospital

PROFESSOR PATTERSON AND STAFF

Requirements for a Master of Science Degree. Candidates for the degree must have been graduated from an acceptable medical school and have completed one year of an approved residency in psychiatry or neurology.

Course requirements vary in accordance with the individual candidate's experience and academic background. In addition to basic courses in psychiatry, neuroanatomy, neuropathology, and neurology, cognate courses in anthropology, psychology, and sociology are considered essential. A thesis based on independent research is a part of the required work. A final oral examination must be passed at least two weeks before the date of graduation and after completion and approval of the student's thesis.

A prerequisite for all courses listed will be stated in the description of the course.

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

704-705-706. Electroencephalography. Three credit hours. Three Quarters. 704, Autumn; 705, Winter; 706, Spring. Lectures and class work on interpretation with laboratory training in the technique of obtaining recordings. General prerequisites must include adequate basic training in psychology or in psychiatry. Permission of the instructor is required. Mr. Parker.

780. Minor Problems. One to four credit hours. All Quarters. Library, conference, and laboratory work. General prerequisites must include adequate pre-clinical training and satisfactory scholarship in regular required course work. Permission of the Chairman of the Department is required. Mr. Patterson.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

801-802-803. Seminar in Psychiatric Literature. Two credit hours. 801, Autumn; 802, Winter; 803, Spring. These seminars will be devoted to the study

of particular fields of psychiatry as represented in current and earlier psychiatric and related writings. Open only to residents in neurology and psychiatry. Mr. Patterson, Mr. Palmer, Mr. Harding.

804-805-806. Seminar in Psychotherapy. Two credit hours. 804, Autumn; 805, Winter; 806, Spring. Clinical work, supported by individual counseling, will be discussed by the group with emphasis on technique and theory. Open only to residents in psychiatry. Mr. Evans, Mr. Hoffman.

807-808-809. Seminar in the Therapy of the Psychoses. Two credit hours. 807, Autumn; 808, Winter; 809, Spring. Current treatment methods, shock therapies, and adjunctive methods of dealing with the major psychiatric disorders will be discussed. Open only to residents in psychiatry. Mr. Michael.

810. Seminar in Child Psychiatry. Two credit hours. One Quarter. Autumn, Winter, Spring. A discussion of theory and technique will be based upon the experiences in the clinic with emphasis on the collaborative team approach represented by the disciplines of psychiatry, social work and psychology. Mr. Gove, Mr. Missildine.

830. Psychiatry for the Social Worker. Three credit hours. Winter Quarter. General prerequisites must include ten hours of social administration including Social Administration 827 and preferably 825. Mr. Palmer.

A consideration of the neuroses and psychoses (organic and functional) as currently classified in psychiatric practice. Emphasis on physical, emotional, and social factors which contribute to the various mental illnesses. Survey description of treatment measures with special attention to ways in which the social workers may facilitate the efforts of the psychiatrist.

950. Psychiatric Research. All Quarters. The student will pursue one or more research problems under the guidance and counseling of the senior staff. Open only to individuals who have completed one year of residency in psychiatry. Staff.

PSYCHOLOGY

Office, 325 Arps Hall

PROFESSORS BURTT, GODDARD (EMERITUS), WILLIAMS (EMERITUS), PRESSEY, TOOPS, RENSCHAW, ENGLISH, SHARTLE, ROBINSON, WICKENS, KELLY, WHERRY, FITTS, ROTTER, KINZER, AND HORROCKS, ASSOCIATE PROFESSORS STOGDILL, FLETCHER, MEYER, PEPINSKY, BURNETT, AND MUSSEN, ASSISTANT PROFESSORS WISPE, RATOOSH, AND SCODEL

The department offers instructional and training facilities in practically all divisions of psychology. For administrative purposes and general guidance of the student, these may be grouped into a number of areas mentioned below, but there is considerable flexibility in the working out of a unified program of study. This should be done in consultation with the adviser as early in the graduate program as possible. A student pursuing work beyond the Master's degree will have an advisory committee of three members which works closely with the student in planning his program. This committee reports annually to the Chairman of the Department as to the student's program and also certifies to the standing committee on examinations when they believe the student is ready for the general examinations and the fields in which he is to be examined.

The preliminary examination for candidates for the Ph.D. comprises the following six units.

1. History, Systematic and Theoretical
2. Perception, Learning and Action
3. Statistics and Research Methodology
4. Theory and Measurement of Individual Differences.
5. Personality Developmental Psychology (Child and Genetic)
6. Abnormal (Counseling and Remediation)

This examination is administered by a standing committee of the Department. It is followed by the qualifying examination administered by the candidate's advisory committee and by the oral examination. Candidates for the Ph.D. in Clinical Psychology must complete a three-Quarter Internship in an institution or have equivalent work experience.

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

601. Experimental Psychology. Three to five credit hours. Autumn Quarter. One lecture and two or more laboratory periods each week. Mr. Renshaw.

The laboratory training course in experimental psychology for advanced undergraduates and graduate students. The experiments are selected both for general cultural value and for preparation for technical research in experimental psychology.

Psychology 601, 602, 608 comprise a unit year's work. Students may enter any Quarter.

602. Experimental Psychology. Three to five credit hours. Winter Quarter. One lecture and two or more laboratory periods each week. Mr. Renshaw.

603. Experimental Psychology. Three to five credit hours. Spring Quarter. One lecture and two or more laboratory periods each week. Mr. Renshaw.

605. Physiological Psychology. Three credit hours. Winter Quarter. Three lectures each week. Mr. Meyer.

A study of some of the physiological correlates of psychological phenomena. The properties of integrated organ systems, with emphasis upon the characteristics of their elements. Psychosomatic abnormalities will be considered.

606. Advanced Physiological Psychology. Three credit hours. Spring Quarter. Three lectures each week. General prerequisites must include Psychology 605 or permission of the instructor must be obtained. Mr. Meyer.

A study of further physiological correlates of psychological phenomena. Sensory and motor processes will be special topics for treatment.

NOTE: For additional courses related to physiological psychology, see: Physiology 638, Physiology of the Special Senses, taught by Mr. Ratoosh of the Psychology Department.

608. Educational Statistics: Elementary. Four credit hours. One Quarter. Autumn, Winter, Spring. Two lectures and two two-hour laboratory periods each week. Students without credit for College Algebra should obtain permission of the instructor. Mr. Toops, Mr. Wherry, Mr. Ratoosh.

A basic statistical course for students intending to conduct major or minor research. Frequency distributions, measures of central tendency and variability; construction of graphs and charts; interpretation of results in terms of probability; simple treatment of correlation. Extended practice in the use of calculating machines and computational devices.

609. Exceptional Children: General Survey. Three credit hours. One Quarter. Autumn, Winter, Spring. Three lecture hours each week. Lectures, discussion, and reports. General prerequisites must include ten hours of psychology. Miss Cassidy.

An analysis of the physical, mental, and social factors which create exceptional behavior in children as deviations from the "normal" pattern. An overflow of available diagnostic techniques for the identification of exceptional behavior. Typical methods of treatment.

610. Adolescence. Three credit hours. One Quarter. Autumn and Spring. Three lectures each week. Mr. Horrocks.

A study of the outstanding characteristics of the adolescent boy or girl, the educational and social problems arising at this period, and means for dealing with these problems.

Not open to students who have credit for Psychology 510.

611. The Intellectual Deviate. Three credit hours. Winter Quarter. Two lecture hours and one conference hour each week. Lectures, reports, clinics, visits to institutions and schools. General prerequisites must include Psychology 609 or permission of the instructor.

A study of the different types of children whose intellectual capacities require special understanding and treatment by parents, teachers, social workers, psychologists, and others. Particular attention given to the slow learning child and to the intellectually gifted child.

613. Mental and Educational Tests. Three credit hours. One Quarter. Autumn and Winter. Two lectures and one conference and laboratory hour each week. Lectures, readings, classroom demonstrations, and special reports. Mr. Horrocks.

A broad basic course for teaching and for students of psychology, clinical work, and sociology. The course will begin with a discussion of tests in school subjects, will then take up tests of

general and special ability and "non-intellectual" traits, and will conclude with a general discussion of the construction of tests and their use in dealing with various practical and research problems.

615. Psycho-Educational Diagnosis and Treatment. Three credit hours. May be taken for one to three Quarters with a maximum credit of nine hours. Autumn, Winter, and Spring Quarters. One lecture and four laboratory hours each week. General prerequisites must include Psychology 683 and permission of the instructor must be obtained. Mr. Robinson, Miss Rosebrook.

Practice in the giving and scoring of tests. Clinical use of test materials in the diagnosis of special disabilities and difficulties in school work; clinical practice with remedial procedures.

622. Delinquent Children. Three credit hours. Spring Quarter. Three lecture hours each week. Lectures, reports, and visits to the Bureau of Juvenile Research. General prerequisites must include thirteen hours of psychology. If this does not include Psychology 609, permission of the instructor must be obtained. Mr. Mussen.

The meaning and significance of delinquency; its psychological basis; causes and prevention; the home and school as factors determining delinquent behavior; the significance of psychological findings for juvenile court procedure; present-day methods of dealing with the problem. The psychology of social conformity versus non-conformity; i.e. misconduct, whether technically delinquent or not.

623. Psychology and Engineering Design. Three credit hours. Autumn Quarter. Lectures, demonstrations, discussion. General prerequisites must include ten hours in psychology; or general psychology or psychological problems in engineering plus nine hours in engineering courses covering motion and time study, quality control, or machine design. Mr. Fitts.

Application of the methods and techniques of experimental psychology to problems of designing equipment for efficient human use. Topics to be considered will include the following: display of information to the eye—visibility, legibility, check-reading; display of information to the ear—speech, intelligibility, tonal signal systems; design of controls for, efficient human use—placement, coding, mode of actuation; problems in the design of man-machine systems.

624. Perception. Three credit hours. Winter Quarter. Three lectures each week. Mr. Renshaw.

The theories and experimental literature dealing with the perception of space, form, size, position, motion, brightness, hue, in vision and the problems in the cutaneous, auditory, olfactory and gustatory modalities.

625. Advanced Psychology of Motivation. Three credit hours. Winter Quarter. General prerequisites must include Psychology 644 or equivalent, or permission of the instructor. Mr. Wickens.

An evaluation of the experimental and theoretical material on: the physiological drives; the development and maintenance of secondary motives; the principles of conditioning and learning needed for motivation theory; perception and motivation.

626. Psychology of Learning. Four credit hours. Autumn Quarter. Four lecture and discussion hours each week. Mr. Wickens.

The principles that underlie the discovery, fixation, and retention of new modes of human behavior. Emphasis is placed on theoretical formulation of the necessary conditions of learning and forgetting.

627. Introduction to Aviation Psychology. Three credit hours. Winter Quarter. General prerequisites must include ten hours of psychology. Mr. Fitts.

A presentation of the psychological principles of perception, motivation, and acquisition of skill as they apply to the aircraft pilot. Topics to be discussed will include the following: (a) the critical requirements of various specialties in aviation; (b) selection problems and procedures; (c) training research; (d) the criterion problem—proficiency measurement; and (e) special psychophysiological problems encountered in flight.

Not open to students who have credit for Psychology 531.

628. Principles and Economy of Learning. Three credit hours. Winter Quarter. Three lectures each week. Lectures, readings in monographs and journals, discussions. General prerequisites must include permission of the instructor and sixteen hours of psychology or graduate standing. Mr. English.

The control of learning activities; memory and forgetting; transfer of training; generalization and thinking in relation to memory; the more elaborate types of learning such as are seen in school work. Special attention will be paid to recent experimentation and theories.

629. Systematic Psychology. Five credit hours. Winter Quarter. Five lectures each week. Permission of the instructor is required. Mr. Ratoosh.

The purpose of this course is to give a larger background to the advanced student of psychology, with respect to other disciplines, especially the sciences, leading to a systematic development of the more complex experiences.

631. Nature and Appraisal of Individual Differences. Three credit hours. Spring Quarter. Three lecture hours each week. General prerequisites must include fifteen hours of psychology or ten hours of psychology and five hours of professional educational subjects. Students who have not had a course in statistics must have the instructor's written permission to register.

Critical consideration of common ideas about ability and other traits. Historical development of measurement of individual differences. Resulting theories of intelligence, special abilities, and other traits. Relation of measurement of individual differences to systematic psychology.

†632. The Psychology of Speech. Three credit hours. Autumn Quarter. General prerequisites must include ten hours of psychology and ten hours of speech. Mr. Knowler.

Psychological processes in speaking. The development of speech in the individual. Speech, personal and social adjustments. Vocal and visible symbolism. The psychology of language; semantics and thinking in speech situations. The experimental approach to the area will be emphasized.

633. The Psychology of the Audience. Two credit hours. Winter Quarter. Two lectures each week. General prerequisites must include Psychology 679 and ten hours of speech. In special cases the speech prerequisite may be waived by permission of the instructor. Mr. Knowler.

The psychological reaction to communication. Analysis of audiences, types of speaking, and speech situations. Procedures in listening. Principles of audience stimulation. Evaluation of speech content and effectiveness. Review of experimental studies on dissemination of information and propaganda techniques.

634. Criminal and Legal Psychology. Three credit hours. Winter Quarter. Three lectures each week. Mr. Burt.

Psychological factors in the determination of reliability of testimony; the technique of detecting crime and falsehood; responsibility; the relation of crime to mental disease or defect; the prevention of crime through environmental factors and heredity.

635. Psychology of Advertising. Three credit hours. One Quarter. Autumn and Spring. Three lectures each week. Mr. Burt, Mr. Wispé.

The psychological principles involved in effective advertising, notably attention, memory and action, with the contributory factors of association, feeling, instinct, suggestion, and reasoning.

637. Industrial Psychology. Three credit hours. Autumn Quarter. Three lectures each week. Mr. Burt.

The application of psychology to problems of industrial learning, adjustment of technical to mental factors, monotony, fatigue, environmental conditions, industrial unrest, morale, and accidents.

639. Psychology and Personnel. Three credit hours. Winter Quarter. Three lectures each week. Mr. Burt.

The application of psychology to problems of personnel. Selection and placement of employees by tests of intelligence and special ability. Trade tests, job analysis, and rating scales.

640. Educational and Vocational Guidance. Three credit hours. Winter Quarter. Mr. Toops.

A course dealing with the technique of evaluating psychological and related factors as a basis for making educational and vocational recommendations to individuals. The place of vocational and educational tests, previous record, and personality traits in determination of choice of occupation or course of study.

† Not given during the academic year, 1954-1955.

644. The Techniques of Human Motivation. Three credit hours. Spring Quarter. Three hours each week. Lectures, recitations, and assigned readings. Mr. Toops.

The psychological bases of initiation and improvement of work. The role of instinct, habit, custom, and tradition, rationalization and psychopathy in motivation. The incentive values of self-ratings, competition, punishment, and such rewards as money, bonuses, participation, and promotion, in relation to the capacities of individuals.

645. History of Psychology. Three credit hours. Autumn Quarter. Three lectures each week. General prerequisites must include sixteen hours in psychology. Mr. Kinzer.

The course aims to view modern psychological problems in the light of their historical antecedents. The development of psychology will be traced from its philosophical antecedents to its present status as a science and a profession. As far as possible assignments will involve reference to original sources.

646. Contemporary Viewpoints in Psychology. Three credit hours. Winter Quarter. Three lectures each week. General prerequisites must include sixteen hours in psychology. Mr. Kinzer.

A consideration of the contributions of various schools beginning with structuralists, functionalists, and behaviorists. Special attention will be given to the points of view of leading psychologists of the present. Such concepts as Gestalt, topology and operational definitions will be especially considered.

647. Theoretical Psychology. Three credit hours. Autumn Quarter. Three lectures each week. General prerequisites must include Psychology 605 and 606. Mr. Meyer.

Organization of the data of physiological psychology into a consistent system with emphasis upon the problems posed by phenomena of sensory-motor correlation.

648. Prejudice and Personality. Three credit hours. Winter Quarter. Three lectures each week. General prerequisites must include a course in social psychology or race relations such as Sociology 622, 634, 604, or 605. Mr. Seaman.

A psychological approach to the understanding of hostile attitudes involved in group conflict. Personality dynamics in prejudice. Psychological effects of discrimination. Psychometric differences between groups as related to stereotypes. Psychological approaches to the reduction of intergroup hostility.

649. Educational Statistics: Elementary. Wright Field only. Three credit hours. One Quarter. Autumn, Winter, Spring. Three lecture hours each week.

A basic statistical course for students intending to conduct major or minor research. Frequency distributions, measures of central tendency and variability; construction of graphs and charts; interpretation of results in terms of probability; simple treatment of correlation.

Not open to students who have credit for Psychology 608.

650. Minor Problems. One or more credit hours. Autumn, Winter, and Spring Quarters. General prerequisites must include sixteen hours in psychology and the permission of the instructor must be obtained. All instructors.

Investigation of minor problems in the various fields of psychology.

By permission of the Chairman of the Department and the Director of the Bureau of Educational Research, students enrolled in this course may obtain credit for research work done under the auspices of the Bureau staff.

***651. Performance Evaluation.** Three credit hours. Spring Quarter. Two lectures and one two-hour laboratory period each week. Given in alternate years, alternating with Psychology 788. General prerequisites must include Psychology 608 and 639. Mr. Wherry.

A discussion of various objective and subjective devices for measuring productiveness and general effectiveness of job performance. The problems of criterion contamination; rationale and construction of various types of rating scales; and combination of criteria.

655. Comparative Psychology. Three credit hours. Winter Quarter. Three lectures each week. General prerequisites must include twenty hours of psy-

* Not given in 1954-1955.

chology or zoology. If twenty hours of zoology are used, a course in animal behavior must be included and permission of the instructor must be obtained. Mr. Meyer.

The principles of animal behavior in relation to human behavior. A study of the similarities and differences in the behavior of animals and of humans and the explanation of these similarities and differences, with special reference to those principles definitely involved in the organism's mode of adjusting to its environment.

656. Advanced Comparative Psychology. Three credit hours. Spring Quarter. Three lectures each week. General prerequisites must include Psychology 655. Mr. Meyer.

A continuation of Psychology 655. Devoted largely to contemporary literature in comparative psychology.

659. University Personnel Psychology. Three credit hours. One Quarter. Winter and Spring. Two lectures and one two-hour laboratory period each week. Mr. Kinzer, Mr. Burnett.

A course designed for students who are preparing for positions in vocational guidance or personnel work in universities. Comparative study of University personnel programs and procedures.

663. Psychology of Childhood. Five credit hours. Autumn Quarter. Four class meetings each week and directed study of a child throughout the Quarter. Graduate students should consult the instructor before enrolling in this course. Enrollment limited to forty. Mr. English, Mr. Horrocks.

The psychological development of the child from three to twelve years. Effects of the school and out-of-school activities on development. Analysis of significant psychological problems involved in curricular activities. Provision by school and other social agencies for the psychological needs of the child.

Each student makes a case study of a child, observing his behavior at home, in school, in varied social situations; and obtaining information about the child from parent, teacher, and other sources. One-fifth of the time of the course is spent in this field study and in making a detailed report thereon.

667. Psychology of Music. Three credit hours. Winter Quarter. General prerequisites must include a course in educational psychology and a course in advanced harmony or consent of the instructor must be obtained. Mr. M. E. Wilson.

The contribution of rhythm, harmony, tone color, form, familiarity, and tactual association to the emotional experience in music. Analysis and measurement of musical talent. Psychological factors in musical interpretation and in the teaching of music.

668. Principles of Gestalt Psychology. Three credit hours. Autumn Quarter. Three lectures each week. Mr. Renshaw.

A survey of the experimental work which supplied the data for the Gestaltist. A study of the basic dynamic principles which constitute the Gestalt system. Application of these principles to perception, learning, thinking, and emotion.

670. Psychological Problems of Adult Life. Three credit hours. Spring Quarter. Mr. Presscy.

A survey of the important recent psychological literature on changes in capacity for learning through the adult years and into old age, changes in incentives and interests throughout these years, emotional development and orientation of adults, psychological problems of work adjustment, adult and parent education, leisure.

671. Principles of Treating the Problem Child. Three credit hours. Winter Quarter. Three lecture hours each week with lectures, recitations and reports. General prerequisites must include thirteen hours of psychology. If this does not include Psychology 609, permission of the instructor must be obtained. Mr. Rotter.

For prospective teachers, counselors and clinicians. A survey of treatment procedures and resources. Methods used in dealing with behavior and personality problems. The flexible use of school environment and community resources, methods of altering attitudes of parent and child, and direct treatment approaches.

672. Psychological Aspects of Biography. Three credit hours. Spring Quarter. One two-hour meeting and one conference hour each week. Prerequisite, Psychology 402 or 407. Mr. Presscy.

The course will make use of the very rich biographical and autobiographical material now available in an effort to understand development trends throughout the life-span and with special reference to the adult years and older ages.

674. Problems of the Dean of Women. Three credit hours. One Quarter. Autumn, Winter, Spring. General prerequisites must include the approval of the instructor. Mrs. Conaway.

Investigation of the minor psychological problems which arise in connection with the social, scholastic, and vocational adjustments of undergraduate women.

676. Advanced Educational Psychology. Three credit hours. Winter Quarter. Three lectures each week. Mr. Pressey.

A course in advanced educational psychology giving a critical appraisal of the implications for education of modern psychological findings.

677. Experimental Social Psychology. Four credit hours. Spring Quarter. Four laboratory hours and two lectures each week. General prerequisites must include a course in social psychology and Psychology 608. Mr. Wispé.

A laboratory course in the methods of experimental social psychology. Typical experiments in such social psychological areas as attitude scaling, suggestion, social perception.

678. Psychology of Personality. Three credit hours. Winter Quarter. Three lectures a week. Mr. Mussen.

This course will consider the individual both as a social and biological unit, relating each group of factors to the development of personality. Particular attention will be given to the major theories of personality and to empirical research on the development and measurement of personality traits.

679. Psychology of Public Attitudes. Three credit hours. Winter Quarter. Three lectures each week. General prerequisites must include a course in social psychology and a course in statistics. Mr. Wispé.

The psychological theory and the measurement of social attitudes. A study of the psychological determinants of attitudes. Emphasis upon problems of definition, analysis, and measurement. Techniques in the quantification of attitudes through scale, poll, and other procedures.

680. Educational Tests and Measurements. Three credit hours. Spring Quarter. Assigned readings and reports. Open to seniors and graduate students of experience with permission of the instructor in charge. Mr. Heck, Mr. Pressey.

A service course for those majoring in Elementary and Secondary Education and School Administration. The course will consider selection of tests and organization of testing programs for elementary and secondary schools; the use of tests in classification, diagnosis, prognosis, and educational guidance; the principles of teacher-made tests; and effect of testing on marking systems.

683. Psychology of Reading. Three credit hours. One Quarter. Autumn and Spring. Three lecture and discussion hours each week. Mr. Robinson, Mr. Kinzer.

Psychological analysis of the reading process. The relationship of this to teaching and remedial methods. Discussion of remedial reading techniques.

684. Psychology of Counseling. Three credit hours. One Quarter. Autumn and Winter. General prerequisites must include thirteen hours of psychology. Mr. Robinson, Mr. Kinzer.

Assumptions and facts fundamental to counseling; factors in the interview situation; nature of counseling techniques; resources in counseling; relation of counseling to other personnel procedures.

687. Psychological Optics. Five credit hours. Spring Quarter. Lectures, laboratory demonstrations, and practice. General prerequisites must include ten hours in general psychology. Mr. Renshaw.

The measurement and diagnosis of the fundamental visual skills; reading and form perception problems; visual training instruments and techniques.

689. Occupational Information. Three credit hours. Winter Quarter. Lectures, discussions, field trips. General prerequisites must include permission of the instructor. Mr. Shartle, Mr. Fletcher.

A survey of occupations and occupational information for guidance counselors and employment interviewers; study of the literature on occupations and occupational information; writing of occupational analyses; field trips to places of employment, to observe workers at work; finding filing and use of occupational information for employment and guidance purposes.

690. Mental Hygiene for Professional Workers. Three credit hours. One Quarter. Autumn and Spring.

The condition under which the individual makes the optimum social adjustment; standards of social adjustment in groups, the pre-determinants of maladjustment and prevention of maladjustment for teachers, personnel, and guidance workers, social workers, psychologists, occupational therapists, and other professional groups.

693. Use of Tabulating Machine Techniques in Research. Two credit hours. Winter Quarter. One lecture and one laboratory period each week. General prerequisites must include Psychology 608, a course in statistics, or permission of the instructor. Mr. Toops.

Methods of large-scale researches involving tabulating machines and other specialized technical devices. Coding of data; operation of sorting and tabulating machines.

695. Clinical Psychology. Three or five credit hours depending on whether laboratory is taken. Spring Quarter. Three lectures or discussions and two laboratory periods each week. General prerequisites must include thirteen hours of psychology, three of which must be on the "600" level. Mr. Kelly.

Discussion of the field of clinical psychology; its methods, its problems and its use in guidance, education, hospitals, industry, and other areas.

703. Special Topics in Psychology. Three credit hours. Winter and Spring Quarters. Lectures and discussions. General prerequisites must include fifteen Quarter hours of Psychology courses in the "600" group or above, and permission of the instructor. May not be elected more than twice. All instructors.

The topics will vary from Quarter to Quarter and will be announced at least one month in advance.

704. Tests and Measurements in Speech Education. Three credit hours. Spring Quarter. General prerequisites must include Psychology 632 and 613. Mr. Fotheringham.

Problems involved in securing and using available and suitable tests and testing procedures in speech. Diagnosis and evaluation. Rating and rater training. Building general and specialized speech tests. Administration and scoring of speech tests. Interpreting test data in this field.

705. Factor Analysis. Three credit hours. Winter Quarter. Given in alternate years, alternating with Psychology 706. General prerequisites must include Psychology 608 and 814 or the permission of the instructor. Mr. Wherry.

The relation of factor analysis to regression and correlation theory; historical review of the principal factor methods and theories; an extraction of factors singly and simultaneously; residuals and reflection; iteration and correction; rotation for meaningfulness; inverse analysis; setting up and interpreting factorial studies.

***706. Mathematical Psychology.** Three credit hours. Winter Quarter. Given in alternate years, alternating with Psychology 705. General prerequisites must include courses in experimental-theoretical psychology such as 601, 624, 625, 626, 646, or statistical psychology such as 814, 816. Mr. Wherry.

An introduction to the use of mathematics in rational theory building. The course will discuss various mathematical systems of psychology, including examples from the areas of the nervous system, attention, discrimination, perception, intelligence, learning, drives, emotions, vision, and selected problems from social psychology.

***713. Laboratory in Psychological and Educational Measurement.** Two credit hours. Spring Quarter. Four laboratory hours each week. This course may be repeated until a maximum of six hours has been earned. General prerequisites must include Psychology 613 or 680 or equivalent and permission of the instructor. Laboratory demonstrations, projects, field work under supervision, and practice in constructing, administering, scoring, and interpreting tests. Mr. Horrocks.

* Not given in 1954-1955.

A laboratory practicum in the construction and use of psychological and educational measuring instruments, including measures of aptitude, achievement, intelligence, personality, interest, and attitude. Students will construct and administer tests and other measures in actual programs in scholastic and industrial situations. Students will familiarize themselves with a wide range of existing measuring instruments in psychology and education and will appraise them critically with a view to their use and revision. Consideration will be given to statistical techniques of construction and appraisal. Students will assist, under supervision, in setting up and appraising testing programs.

718. The Psychology of Group Psychotherapy. Two credit hours. One Quarter. Autumn and Spring. Two class periods each week. If Psychology 671 has not been taken, permission of the instructor must be obtained. Mr. Scodel, Mr. Pepinsky.

Primarily for students who may use psychological group methods in professional work. General principles of group therapy and specific methods with children and adults described and evaluated.

781. Laboratory in Educational Counseling. Three to five credit hours. One Quarter. Autumn, Winter, Spring. May be taken for one or more Quarters with a maximum credit of ten hours. One two-hour lecture, discussion, and demonstration period, and five to nine hours of practical experience in counseling and related activities. General prerequisites must include twenty hours of psychology including Psychology 684 and 659, prior or concurrent, and permission of the instructor. Enrollment is limited by extent of laboratory facilities. Mr. Robinson, Mr. Kinzer.

Supervised practice in assisting beginning college students in their adjustment to curricular and extra-curricular activities. This includes methods of psycho-educational diagnosis, principles of effective learning, and remedial reading instruction. Recordings are made of interviews and specific help is given with interviewing techniques.

782. Laboratory in Psychology of Campus Group Activities. Two credit hours. One Quarter. Autumn, Winter, Spring. May be taken for one or more Quarters with a maximum credit of six hours. One two-hour lecture, discussion and demonstration period and four hours of practical experience in residence halls, student government and other organized campus groups. General prerequisites must include Psychology 659, 674, 684, and 781, prior or concurrent, and permission of the instructor. Miss Hopwood.

The course offers an opportunity for mature students to gain practical experience in working with the residence hall program and other organized campus group activities. Techniques and problems of different types of groups will be considered together with the role of the adviser. The culture matrix of the university community will be discussed in the class sessions.

785. Vocational Guidance Laboratory. Three to five credit hours. Winter and Spring Quarters. This course may be repeated until ten hours have been earned. One two-hour lecture, discussion, and demonstration period, and five to nine hours of practical experience in counseling and related activities. General prerequisites must include Psychology 613 and 781 and permission of the instructor. Mr. Fletcher, Mr. Pepinsky.

An opportunity for mature students who have adequate background to obtain practical experience in guidance and counseling. Practice in counseling with both in-school and out-of-school youth, with parents, employers, and social agencies. At present the counseling is done through the facilities of the Occupational Opportunity Services.

NOTE: It is suggested that students may find considerable profit in repeating the course. Such repetition represents additional experience and meeting a greater variety of problems.

788. Laboratory in Employment Techniques. Three credit hours. Spring Quarter. This course may be repeated until nine hours have been earned. Six laboratory hours each week. General prerequisites must include Psychology 608; six hours selected from Psychology 613, 637, 639, 651, 684, 689; and permission of the instructor. Mr. Wherry, Mr. Fletcher.

Supervised practice in the application of psychology to employment problems and in the use and construction of psychological techniques for hiring employees. Actual planning and administration selected from the areas of job and worker analysis, employee interviewing,

application blanks, testing, job classification, placement, and evaluation. Work may be carried on either in the laboratory or, on occasion, in selected business or manufacturing establishments or employment offices.

Not open to students who have credit for Psychology 638 or 688.

***799. Workshop for School Psychologists.** Four credit hours. Summer Quarter. Full time of students for three weeks of first term. Director, Mr. Phelps.

This workshop is designed for persons currently working as school psychologists in the area of child study. It is open only to students with an M.A. in school psychology or its equivalent. Especially well-qualified students who have preparation just short of the M.A. may be admitted by special permission of the director of the workshop. New developments in the psychological appraisal of children will be reviewed. Students will study individual children and the results will be discussed in group conferences. Practical problems encountered on the job will be discussed. Techniques of working with parents, teachers, and children will be considered. Lectures will be given by specialists in the areas of psychology and education. Enrollment limited to 20 students.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

These prerequisites include the equivalent of at least two years of psychology; or of one year of psychology and one year of college work in one of the following subjects: philosophy, mathematics, physiology, physics, zoology, sociology.

802. Seminar in Experimental Psychology. Two credit hours. Autumn, Winter, and Spring Quarters. Permission of the instructor is required. Mr. Renshaw, Mr. Wickens, Mr. Fitts, Mr. Meyer, Mr. Ratoosh.

803. Seminar in Educational Psychology. Two credit hours. Autumn Quarter. Permission of the instructor is required. Mr. Pressey, Mr. English.

804. Seminar in Psychological Measurement. Two credit hours. Winter Quarter. Permission of the instructor is required. Mr. Horrocks.

805. Contemporary Psychological Literature. One credit hour. Autumn, Winter, and Spring Quarters. Mr. Renshaw.

806. Seminar in Clinical and Abnormal Psychology. Two credit hours. Autumn, Winter, and Spring Quarters. Two sections; A and B may be offered in any given Quarter. Permission of the instructor is required. Mr. Kelly, Mr. Rotter, Mr. Mussen, Mr. Scodel.

807. Seminar in Industrial Psychology. Two credit hours. Autumn and Spring Quarters. Permission of the instructor is required.

***810. Psychological Problems in Higher Education.** Two credit hours. Autumn Quarter. One meeting each week. Mr. Pressey.

A critical review of the research work thus far done on such problems as study methods, background information essential for college work, individual differences, placement tests, measurement of progress. The course is intended to give graduate students preparing for college or university positions contact with current educational research regarding the problems they will meet, and develop a research attitude toward these problems.

811. Advanced Theoretical Psychology. Four credit hours. Spring Quarter. Three lectures each week. Mr. Wickens.

A description and evaluation of the major advanced psychological behavior theories.

812. Advanced Social Psychology. Three credit hours. Autumn Quarter. Three meetings each week. General prerequisites must include twenty-five hours of psychology including an introductory course in social psychology and at least one course in advanced general psychology, such as 624 or 626. Mr. Wispé.

An advanced course in social psychology treating the problems of learning and perception relative to the social environment, the influence of culture in the development of individual behavior patterns, and related topics.

* Not given in 1954-1955.

813. Seminar in Social Psychology. Three credit hours. Winter Quarter. One meeting each week. General prerequisites must include permission of the instructor. Mr. Wispé.

814. Advanced Statistics. Four credit hours. Winter Quarter. Two lectures and two two-hour laboratory periods each week. General prerequisites must include a course in educational statistics or permission of the instructor. Mr. Toops.

Special cases in correlation; non-linear regression; construction of criteria; sampling; statistical machines; derivation of commonly used equations; critical readings; construction of tables and graphs to meet the research needs of individual students.

815. Seminar in Psychological Statistics. Two credit hours in each of two successive Quarters. Autumn and Winter Quarters. Permission of the instructor is required. One two-hour discussion period each week. Mr. Wherry, Mr. Toops, Mr. Ratoosh.

Statistical background equivalent to the sequence Psychology 608, 814 is assumed. Critical discussion of problems in the forefront of statistical psychology.

816. Special Statistical Methods. Four credit hours. Spring Quarter. Two lectures and two two-hour laboratory periods each week. General prerequisites must include Psychology 608 and 814 or equivalent. Mr. Wherry.

The statistics of aptitudes, mental growth and attainment. Item analysis, quantification of qualitative data and pertinent psycho-physical theorems. Construction of tables and graphs to meet the individual needs of advanced students of psychology and education.

818. Theories of Personality. Three credit hours. Spring Quarter. Three lectures each week. General prerequisites must include advanced work in personality and social psychology. Permission of the instructor is required. Mr. English.

A critical consideration of the theories of personality structure and origin.

822. Seminar in Student Personnel Psychology. Two credit hours. Autumn, and Spring Quarters. Permission of the instructor must be obtained. Mr. Robinson, Mr. Kinzer, Mr. Fletcher, Mr. Pepinsky, Mr. Burnett.

823. Personnel Psychology. Three credit hours. Spring Quarter. General prerequisites must include Psychology 626 and 684. Mr. Pepinsky.

Implications of fact and theory in the fields of learning and personality development for the various approaches used in personnel work. Personality development engendered through personnel activities. Therapeutic aspects of the psychologist-client relationship in individual and group activities. Assessment of treatment procedures.

824. Psychological and Child Study Services in the Public Schools. Three credit hours. Spring Quarter. General prerequisites must include Psychology 608, 613, 615, and 861 or their equivalents. Miss Cassidy, Mr. Phelps.

Consideration of the role of the school psychologist in the administrative structure of public schools; working with teachers and parents; planning school testing programs and pupil personnel record systems; working with state and community agencies.

825. Methodological Foundations of Experimental Psychology. Five credit hours. Spring Quarter. Mr. Fitts.

Problems of the definition of psychological concepts, formulation and testing of hypotheses, construction of theory, and the formulation of empirical generalizations are considered with reference to their implications for the design of psychological experiments. Common experimental designs and methods of measurement in psychology are analyzed in terms of their logical and statistical advantages and limitations as the basis for inductive generalizations.

826. Practicum in the Use of Personality Adjustment Techniques. Three to five credit hours. Autumn, Winter, and Spring Quarters. This course may be repeated until ten credit hours have been earned. One two-hour lecture, discussion, and demonstration period, and five to nine hours of practical experience in counseling and related activities. Permission of the instructor must be obtained. General prerequisites must include twenty hours of psychology

including 684 and one of the following courses: Psychology 781, 785, 820, and permission of the instructor. The enrollment is limited by the extent of laboratory facilities. Mrs. Stogdill.

An opportunity for mature students with adequate background and training to obtain practical experience, under guidance, in the use of personality adjustment techniques at the college level.

NOTE: It is suggested that students may find it profitable to repeat the course. Such repetition represents additional experience in meeting a greater variety of problem situations.

827. Practicum in Student Personnel Work. Two credit hours. Winter Quarter. Two lectures each week, and assigned hours of supervised experience in various student personnel offices on the campus. General prerequisites must include Psychology 781 and permission of the instructor. Mr. Fletcher, Mr. Robinson.

An opportunity for advanced graduate students particularly interested in student personnel work to obtain supervised experience in the Registrar's Office, the Dean of Men's Office, the Ohio Union, the College Offices, and other student personnel offices.

829. Advanced Statistics. Wright Field only. Three credit hours. Winter Quarter. Three lecture hours each week.

Special cases in correlation; non-linear regression; construction of criteria; sampling; statistical machines; derivation of commonly used equations; critical readings; construction of tables and graphs to meet the research needs of individual students.

Not open to students who have credit for Psychology 814.

830. Special Statistical Methods. Wright Field only. Three credit hours. Spring Quarter. Three lecture hours each week.

The statistics of aptitudes, mental growth and attainment. Item analysis, quantification of qualitative data and pertinent psycho-physical theorems. Construction of tables and graphs to meet the individual needs of advanced students of psychology and education.

Not open to students who have credit for Psychology 816.

831. Advanced Experimental Laboratory. Three to fifteen credit hours. Autumn, Winter, and Spring Quarters. May be taken one, two or three Quarters with a maximum credit of fifteen hours. Laboratory and conferences. Admission only after consultation with the instructor. Mr. Renshaw, Mr. Wickens, Mr. Fitts, Mr. Meyer, Mr. Ratoosh.

Advanced training in the experimental and quantitative methods in the several areas of general experimental psychology and comparative psychology.

840. Theory of Human Development. Three credit hours. Spring Quarter. Three lectures each week. Mr. English, Mr. Pressey, Mr. Horrocks.

A critical consideration of the published data and interpretations of research which throw light on problems of human development. The meaning of development, the methods of investigation, and the units of measurement will be emphasized.

***850. Seminar in the Psychology of Maturity and Old Age.** Two credit hours. Winter Quarter. Mr. Pressey.

861. Clinical Psychology. Three or five credit hours. Autumn Quarter. Three lectures or discussions and two laboratory periods each week. Permission of the instructor is required. Mr. Mussen.

Introduction to the theory and use of clinical methods in psychology including interviewing, observation of free behavior, case documentation, professional problems, and individual testing. The course is designed for first-year graduate students.

862. Psychopathology. Three to five credit hours. Winter Quarter. Three lectures or discussions and two laboratory periods each week. Permission of the instructor is required. Mr. Kelly.

Mental handicaps, personality disturbances, and social maladjustments together with their clinical manifestations. The laboratory is a continuation of training in psychometrics and interviewing. The course is designed for first-year graduate students majoring or minoring in clinical psychology and normally succeeds Psychology 861. In special cases, it may be taken for three hours credit by securing permission of the instructor to omit the laboratory part of the course.

* Not given in 1954-1955.

Training in interviewing and psychometrics conducted primarily through field laboratories by means of contact with several institutions. Students should allow sufficient free time to permit scheduling of institutional contacts.

Not open to students who have credit for Psychology 642 or 742.

863. Psychodynamics. Three to five credit hours. Spring Quarter. Three lectures or discussions and two laboratory periods each week. Permission of the instructor is required. Mr. Rotter.

The analysis and mobilization of psychological forces that make for personal adjustment. Laboratory training includes participation in the services of the Psychological Clinic in relatively simple psycho-educational cases. The course is designed primarily for first-year graduate students majoring in clinical or school psychology and normally succeeds Psychology 862. In special cases it may be taken for three hours credit by securing permission of the instructor to omit the laboratory part of the course.

Not open to students who have credit for both Psychology 619 and 808.

864. Psychodiagnostics. Three to five credit hours. Autumn Quarter. Three lectures or discussions and two laboratory periods each week. Permission of the instructor is required. Mr. Rotter.

Introduction to the theory and use of psychodiagnostic tests and procedures, including projective methods, test pattern analysis, play protocols, concept formation tests, and special tests of dysfunction. The laboratory includes practice in the administration and scoring of representative tests and procedures. The course is designed for second-year graduate students majoring in clinical psychology and normally succeeds Psychology 863. In special cases it may be taken by advanced graduate students for three hours credit.

Not open to students who have credit for both Psychology 809 and 819. Laboratory not open to students who have credit for Psychology 819.

865. Advanced Psychological Clinic. Two to thirteen credit hours; may be taken for one or more Quarters with a maximum total credit of thirteen hours. Lectures Autumn and Winter Quarters. Practicums Autumn, Winter, and Spring Quarters. Normally, Psychology 864 must have been completed or be taken concurrently. Two lectures a week on advanced psychotherapeutic principles continuing through the Autumn and Winter Quarters with two hours credit each Quarter or a total of four hours credit for the lecture portion of the course. Three hours of credit are allowed for each practicum with a maximum total of nine hours of practicum credit. The student may not receive credit for more than two practicums of one type. The permission of the instructor is required. Mr. Kelly, Mr. Mussen, Mr. Scodel, Mr. Rotter.

Two types of practicum are offered in connection with the community services of the Psychological Clinic; Type A, psychological advisory services, primarily for children in collaboration with schools, institutions, and other community agencies; and Type B, psychological treatment services, primarily for children or for university students who are referred for problems requiring psychological treatment of a clinical type. Each unit of practicum requires a minimum of six hours of supervised duty per week throughout a Quarter in addition to special preparations for the particular types of cases seen. Practicums are taken concurrently with or subsequently to the lectures.

880. Supervised Field Experience in Psychology. Three to eight credit hours. Autumn, Winter, and Spring Quarters. May be repeated for not more than three Quarters, with a maximum credit of fifteen hours. Open only to graduate majors in psychology beyond the Master's level. Must be supervised by a member of the local staff and some member of the outside agency approved by the Department of Psychology. Enrollment must be approved by staff of the local area in which the student is specializing.

Supervised experience, either research or operational, in an agency doing professional psychological work such as a school system, a psychological clinic, an industrial personnel department, or a counseling center.

Credit for this course may not be counted toward residence for the Ph.D. degree.

899. Interdepartmental Seminar. One to five credit hours. All Quarters. When two or more departments desire to establish an interdepartmental seminar on a subject of common interest, the chairmen or authorized representatives of the departments concerned shall prepare a course description including

the names of faculty members designated to conduct the seminar. The statement shall be submitted to the Executive Committee of the Graduate School for prior approval.

910. Field Training in Clinical Psychology. One to ten credit hours. All Quarters. May be taken for one or more Quarters with a maximum of forty-eight hours. If a student completes ten hours of this type of work, the next six Quarter hours of 910 may be counted as residence toward the Ph.D. degree. The remaining hours will be used toward the satisfaction of the field training requirements in clinical psychology. Admission only on written permission of the Director of the Psychological Clinic. Mr. Rotter.

This course provides opportunity for supervised field training in neuropsychiatric hospitals, mental hygiene clinics, and other agencies in which clinical psychology is used in the study and treatment of neuropsychiatric patients, including the program in clinical psychology of the Veterans' Administration. The work will include application and interpretation of psychological diagnostic methods; remedial training, group therapy and other types of psychological therapies; and research into the problems of psychological disorders.

Because of the peculiar requirements of this work a special laboratory fee of \$35.00 per credit hour must be required.

950. Research in Psychology. Autumn, Winter, and Spring Quarters. All instructors.

Primarily intended for students offering theses for advanced degrees.

By permission of the Chairman of the Department and the Director of the Bureau of Educational Research, students enrolled in this course may obtain credit for research work done under the auspices of the Bureau staff.

Graduate majors in clinical psychology must carry at least one credit of Psychology 950 every Quarter and participate in a "research team."

PUBLIC ADMINISTRATION

Work toward the degree of Master of Science in Public Administration is directed by the Committee on Graduate Study of the Department of Political Science, under the immediate supervision of a subcommittee consisting of Professors Walker, Zink, and Heckman. Students should consult this subcommittee. The programs of study enlist the relevant facilities in other departments of the University.

It is the object of this program to prepare students for responsible posts in government service, particularly in administrative work, and to provide advanced studies or a broader background for government officials who can arrange to be in residence on this campus. Public personnel administration, public reporting, taxation and public finance, legislative drafting, governmental research, governmental accounting, and other fields not included in other professional curricula of the University, all offer opportunities for a career. The student who secures both a broad foundation and a grasp of technique is in demand both by government and by private research agencies. A broad foundation is offered by the undergraduate curriculum in public administration in the College of Commerce and Administration or by a major in political science or economics. The detailed requirements of these undergraduate curricula and of the graduate curriculum which follows are subject to modification to meet the needs of individual students. Students who have not met these requirements of a broad background in the fields of government and economics may find it necessary to spend a somewhat longer time on their graduate work in order to complete the work for the degree.

REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN PUBLIC ADMINISTRATION

To receive this degree, students must be in residence at The Ohio State University for at least three Quarters and an additional Quarter must be devoted to field work with some governmental or research agency approved by the adviser. A report upon such field work must be filed with the adviser and approved by him. Students who have had experience in government service may request a waiver of the field work requirement. Organizations with which field work may be done include: federal government agencies, the State of Ohio, the principal cities of the state, the important counties of Ohio, public and private governmental research, and numerous other organizations of local or state-wide scope. Candidates for the degree of Master of Science in Public Administration must also meet the same requirements in regard to a thesis and final examination as are prescribed for the degrees of Master of Arts and Master of Science.

CURRICULA IN PUBLIC ADMINISTRATION

GENERAL REQUIRED COURSES

Autumn Quarter		Winter Quarter		Spring Quarter	
Political Science	(781) 3	Political Science	(803) 3	Political Science	(950) 5
Methods of		Public Administration		Thesis	
Governmental Research		Political Science	(606) 5		
Political Science	(605) 5	Principles of			
Principles of Public		Public Administration II			
Administration I					

PUBLIC PERSONNEL ADMINISTRATION (OPTIONAL)

Business Organization	(680) 5	Business Organization	(686) 4	Business Organization	(691) 3
Industrial Organization		Personnel Organization		Office Organization	
and Management		and Management		and Management	
Psychology	(618) 3	Business Organization	(693) 3	Business Organization	(692) 3
Mental and Educational		Wage and Salary		Problems in Personnel	
Tests		Administration		Organization and	
Economics	(637) 5	Political Science	(614) 3	Management	
The American		Public Personnel		Psychology	(684) 3
Labor Movement		Administration		Psychology of Counseling	
		Psychology	(639) 3	Psychology	(651) 3
		Psychology and Personnel		Performance Evaluation	

BUDGETING AND PUBLIC FINANCE (OPTIONAL)

Economics	(631) 3	Economics	(632) 3	Economics	(633) 3
Governmental		Governmental Revenues		Governmental Fiscal	
Expenditures		Economics	(711) 2	Administration	
Economics	(710) 2	Statistical Analysis		Economics	(712) 2
Statistical Analysis		Accounting	(604) 5	Statistical Analysis	
Accounting	(603) 5	Cost Accounting		Accounting	(830) 3
Cost Accounting				Governmental Accounting	

MUNICIPAL ADMINISTRATION (OPTIONAL)

Social Administration	(703) 2	Political Science	(809) 3-5	Economics	(719) 3
Problems and Programs		Municipal Government		Public Control of	
in Public Health and		Social Administration	(841) 2	Economic Processes	
Medical Care		Public Welfare		Sociology	(645) 4
Sociology	(614) 4	Administration		Leisure and Recreation	
The Community		Sociology	(625) 5	Geography	(634) 3
Prevent. Medicine	(753) 2	Criminology		Urban Geography	
Prin. of Public Health					
Administration					
Political Science	(607) 5				
American Municipal					
Government					

LEGISLATIVE SERVICE (OPTIONAL)

Political Science	(635) 5	Political Science	(634) 5	Political Science	(633) 3
American Political Parties		Public Opinion and		Legislation	
and Pressure Groups		Political Processes		Political Science	(782) 3
Political Science	(812) 3			Non-Rational Factors	
Legislation (Seminar)				in Politics	
Political Science	(611) 5				
Introduction to Juris-					
prudence					

RADIOLOGY

Office, University Hospital

PROFESSOR HUGH J. MEANS (EMERITUS), ASSOCIATE PROFESSOR MORTON AND STAFF

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

780. Minor Problems. One to five credit hours. All Quarters. General

prerequisites must include adequate pre-clinical training and satisfactory scholarship in regular required courses. Permission of the Chairman of the Department is required. The staff.

Library, conference and laboratory work.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

950. Radiological Research. All Quarters. General prerequisites must include acceptable courses in the basic pre-clinical sciences and proof of and interest in and the ability to undertake the selected project. Permission of the Chairman of the Department is required. Mr. Morton.

The student may spend a part or all of his time in research work and he must be registered in the Graduate School. Opportunities are available for research in all the branches of Radiology. The work may be done at the University, St. Francis, and Children's Hospitals. Opportunities for investigation of the betatron and radioactive isotopes in their application to medicine are also available.

RHETORIC AND ENGLISH LANGUAGE

(See Speech)

ROMANCE LANGUAGES AND LITERATURES

Office, 111 Derby Hall

PROFESSORS ROCKWOOD, MOORE, HAVENS, ANIBAL, DEMOREST, SCHUTZ, GILMAN, AND MONROE (EMERITUS), ASSOCIATE PROFESSORS ARMITAGE AND ROGERS, ASSISTANT PROFESSORS MEIDEN, ROZZELL, PRADAL, CARLUT, DOOLITTLE, BORELLI, AND SAPON

Students intending to major in French are urged to elect the following courses outside the department: Latin 627, Classical Languages 520-521-522, Philosophy 515, 601, 602, 603, 604, German 705, History 624-625.

Students intending to major in Spanish are urged to elect the following courses outside the department: Latin 627, Classical Languages 520-521-522, Philosophy 515, 601, 602, 603, 604, German 705, History 645-646, Fine Arts 674-675.

GRADUATE ROMANCE CLUB

The Graduate Romance Club is an organization of students and faculty for the purpose of encouraging research, study, and appreciation in the field of the Romance Languages and Literature. Its meetings, held three times each Quarter, offer opportunity for reports on individual investigations, articles in current journals, or more general discussions of professional interest.

REQUIREMENTS FOR GRADUATE DEGREES

The major will ordinarily be French or Spanish.

Requirements for the Master's Degree: Graduate work in the field of Romance Languages presents two main aspects: the linguistic, and the literary. The candidate for the Master's degree should have: (1) a good written and oral command of his major language (to be tested by examination during one of the early Quarters of graduate work); (2) a general knowledge of the development of his major language from the earliest times and of his major literature from the beginning of the Sixteenth Century to the present day. The final comprehensive examination covering the above fields will be written and will include at least one question to be answered in the major language. A minimum reading list as a general guide in the preparation for this examination can be obtained at the office of the Department of Romance Languages.

In addition to the advanced courses (or their equivalent) covering the field of the final written examination, the candidate majoring in French should complete French 801, 802, 813 (Old French Language and Literature), 880 (Bibliography and Method), and at least two seminars in French literature (French 811, 812, or 817).

Similarly, the candidate majoring in Spanish should complete Spanish 805, 806, 821 (Old Spanish Language and Literature), 880 (Bibliography and Method), and at least two seminars in Spanish or Spanish American literature.

Courses should be approved by an adviser and the Graduate Committee.

The Master's thesis may deal either with a linguistic or a literary subject. The final oral examination will be devoted in part to the field of the thesis and will be conducted at least partly in the major language.

Requirements for the Doctor's Degree: In addition to the requirements for the Master's degree, as outlined above, the candidate should have a more extensive and a more intensive knowledge of linguistics and literature in his major, with emphasis upon one field or the other,

depending on the nature of the specialization indicated by his doctoral dissertation. If the major is in French, this knowledge should include Old French language and literature, and either Old Spanish or Old Italian. If the major is in Spanish, the candidate should present Old Spanish language and literature, and either Old French or Old Italian language.

In work completed for the doctorate, exclusive of the Ph.D. thesis, at least forty-five Quarter hours, including that completed for the Master's degree, should be in the "800" and "900" area.

The candidate should have first and second minor fields, ordinarily represented by two Romance languages and literatures other than the major. Reading lists as guides in the preparation of these fields may be obtained at the office of the Department of Romance Languages. The courses chosen are to be approved by the student's major adviser and by the Graduate Committee of the Department.

For the first minor, the candidate shall select a minimum of three fields, or periods, as for example, the Renaissance, Classicism, the Golden Age, the Eighteenth Century, Romanticism, Contemporary Literature, etc., with the approval of his adviser and the Graduate Committee, and shall present himself for a written examination in these minor fields at least one Quarter before taking his General Examination in his major in accordance with the requirements of the Graduate School.

For the second minor, a minimum of five Quarter hours of "600" work or above is required. There will be no comprehensive examination in the second minor.

The foreign language requirements of the Graduate School, which, for this department, normally involve a reading knowledge of German and a Romance Language other than the major, must be met before the candidate takes his General Examination in his major field. In addition, a knowledge of Latin is most desirable.

The General Examination in the major will be given not later than the middle of the second Quarter prior to the Quarter in which the candidate plans to present himself for his degree. At least part of this general written examination will be conducted in the major language.

The doctoral dissertation may deal either with a linguistic or a literary subject in the candidate's major language. A final oral examination, conducted at least partly in the major language, is given in the field of the dissertation.

FRENCH

405. Reading of French. No credit. Autumn, Winter, and Spring Quarters. Three meetings each week. No prerequisite. Not accepted as a prerequisite for any other course in this department.

This course is open only to graduate students who wish to acquire a reading knowledge of French, and is designed primarily for students who have had no formal preparation in this language.

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

*603. The Romantic Period in French Literature, 1800-1850. Five credit hours. Autumn Quarter. Given biennially, alternating with French 604. General prerequisites must include an introductory course in modern French literature. Mr. Demorest.

The development of romanticism and rise of realism in the first half of the Nineteenth Century in the novel, poetry, and drama.

604. French Literary Currents, 1850-1914. Five credit hours. Autumn Quarter. Given biennially, alternating with French 603. General prerequisites must include an introductory course in modern French literature. Mr. Demorest.

Realism, naturalism, and the movements of reaction in the novel and drama. The Parnassians and the Symbolists in poetry. Modern French literary critics.

*616. French Literature of the Renaissance. Five credit hours. Spring Quarter. Given biennially, alternating with French 617. General prerequisites must include an introductory course in modern French literature. Mr. Moore. Marot, Rabelais, the Pléiade, Montaigne.

617. French Classicism, 1600-1715. Five credit hours. Spring Quarter. Given biennially, alternating with French 616. General prerequisites must include an introductory course in modern French literature. Mr. Rockwood.

The formation of the classic spirit. The perfection of dramatic form and the Seventeenth Century portrait of man. Selected works of Malherbe, Descartes, Pascal, La Bruyère, Boileau, Corneille, Molière, and Racine.

* Not given in 1954-1955.

618. French Literature of the Enlightenment. Five credit hours. Winter Quarter. Given biennially, alternating with French 640. General prerequisites must include an introductory course in modern French literature. Mr. Havens.

A study of the ideas of the Eighteenth Century in their relation to modern times. Special emphasis on Montesquieu, Voltaire, Diderot, and Rousseau.

619. French Translating. Three credit hours. Spring Quarter. General prerequisites must include courses in French conversation and composition. Mr. Havens.

Translating from French to English and from English to French. This course is helpful in preparing for teaching or for military, diplomatic, or other special service where exact linguistic knowledge is needed.

***627. French Pronunciation.** Three credit hours. Three meetings each week with laboratory practice. General prerequisites must include courses in French conversation and composition. This class is limited to twelve.

The formation of French sounds. Lectures, with exercises in the use of the symbols of the International Phonetic Association. A study of the rules of French pronunciation. Drill in the reading of French. Designed for advanced students who expect to teach French.

Not open to students who have credit for French 632.

***628. Modern French Syntax.** Five credit hours. Autumn Quarter. General prerequisites must include a course in French conversation and composition. Mr. Meiden.

Systematic review of French grammar with composition and other exercises, based on contemporary authors. Modern tendencies in syntactic analysis.

***628a. Modern French Syntax.** Three credit hours. General prerequisites must include an introductory course in modern French literature. Mr. Schutz.

Selected topics for grammar review, with composition to illustrate. Consideration of present tendencies in syntactic analysis, with text exercises to illustrate.

Not open to students who have credit for French 628.

†629. History of the French Language. Three credit hours. Summer Quarter. Mr. Schutz.

A survey from Roman times to the present with emphasis on those cultural and social factors which helped make the French language what it is today. The relations of language to literature. Introduction to modern principles and methods in linguistics.

Lectures, readings, reports.

632. French Pronunciation. Five credit hours. Winter Quarter. General prerequisites must include a course in French conversation and composition or an introductory course in modern French literature. This class is limited to twelve. Mr. Rockwood.

The formation of French sounds. Lectures, with exercises in the use of the symbols of the International Phonetic Association. A study of the rules of French pronunciation and diction. Drill in the reading of French.

Not open to students who have credit for French 627.

***633. Modern French Drama.** Three credit hours. Lectures, collateral reading, and reports. General prerequisites must include an introductory course in modern French literature or equivalent. Mr. Havens.

The end of the Nineteenth and the early years of the Twentieth Centuries. The Théâtre Libre. Realism, Naturalism, comedy, and psychological drama. Becque, Bernstein, Brieux, Mirbeau, Courteline, Porto-Riche, Curot, and others.

634. Contemporary French Drama. Three credit hours. Autumn Quarter. Lectures, collateral reading, and reports. General prerequisites must include an introductory course in modern French literature or equivalent. Mr. Carlut.

Study of plays by Lenormand, Romains, Claudel, Giraudoux, Cocteau, Montherlant, Anouilh, Sartre, Camus, and others. The different theaters and directors from Copeau to the present day.

635. La civilisation française jusqu'à la Révolution. Three credit hours.

* Not given in 1954-1955.

† Not given during the academic year, 1954-1955.

Winter Quarter. General prerequisites must include an intermediate course in French conversation and composition. The course is conducted in French. Alternates with French 636. Mr. Carlut.

A study of the major developments of French culture down to the Nineteenth Century. The course is designed to give the student greater facility in understanding, speaking, and writing French.

*636. *La civilisation française depuis la Révolution*. Three credit hours. Winter Quarter. General prerequisites must include a course in French conversation and composition. The course is conducted in French. Alternates with French 635. Mr. Carlut.

The principal object of the course is to increase the student's facility in understanding, speaking, and writing French. The material for discussion is drawn from the life, institutions, and culture of Nineteenth and Twentieth Century France.

*637. *French Diction*. Two credit hours. Spring Quarter. General prerequisites must include French 632 or equivalent. The class is limited to twelve. Mr. Rockwood and assistant.

Analysis and preparation of interpretive reading of prose and verse.

†638. *Advanced Spoken and Written French*. Three credit hours. Spring Quarter. General prerequisites must include courses in French conversation and composition. Mr. Havens.

Intensive practice in speaking and writing French based on contemporary usage.

*639. *Explication de textes*. Three credit hours. General prerequisites must include an introductory course in modern French literature.

Works of Racine, Pascal, Voltaire, Rousseau, Chateaubriand, Stendhal, Sainte-Beuve, Hugo, Baudelaire, Maupassant, Rimbaud, Apollinaire, Claudel, Proust, Gide, and Eluard.

*640. *France in Contemporary Literature*. Five credit hours. Winter Quarter. General prerequisites must include an introductory course in French literature. Mr. Demorest.

From Dadaism to Existentialism. Literary currents and their significance, with special attention given to the novel. Proust, Gide, Duhamel, Romain, Malraux, Colette, Mauriac, Giraudoux, Saint-Exupéry, Camus, Sartre, and others.

†645. *French Literature*. Three to five credit hours. All Quarters. Five meetings each week. Students may secure credit under this course number not to exceed fifteen hours. General prerequisites must include an introductory course in Modern French literature. Senior staff.

Under this course number senior members of the department will conduct advanced studies of significant topics that are covered only briefly if at all in other offerings of the department.

*651. *Modern French Poetry*. Three credit hours. Autumn Quarter. Lectures, discussions, and reports. General prerequisites must include an introductory course in modern French literature. Mr. Doolittle.

Sources and processes of poetic creation as exemplified in selected works of French poets, from Baudelaire to the present, with emphasis on the Twentieth Century.

670. *French Literature in English Translation*. Five credit hours. Autumn Quarter. Lectures, collateral reading and reports. Mr. Havens.

A survey of French masterpieces in English translation from Montaigne to Proust, with special reference to their bearing on English or American literature.

This course, which may be used to satisfy the literature requirement in the humanities of the College of Arts and Sciences, may not be counted toward a French major.

701. *Minor Problems in French*. One to five credit hours. Autumn, Winter, and Spring Quarters. General prerequisites must include the permission of the instructor. Professors, Associate, and Assistant Professors.

NOTE: METHODS COURSE. See the Department of Education, Course 692.

* Not given in 1954-1955.

† Not given during the academic year, 1954-1955.

FOR GRADUATES

800 and 800 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

801. Introduction to Old French. Three credit hours. Winter Quarter. General prerequisites must include at least three years of collegiate French and some knowledge of Latin. French 813 is desirable but not essential. Mr. Schutz.
Early history of the French language. Elements of old French phonology and morphology.

802. Introduction to Old French. Three credit hours. Spring Quarter. General prerequisites must include French 801. Mr. Schutz.
Continuation of Old French phonology and morphology, with increased attention to their application in linguistic geography and text criticism. A short review of current attitudes and practices in Romance philology. Some consideration will be given to semantics.

803. Old Provençal. Three credit hours. Autumn Quarter. General prerequisites must include French 802 or Spanish 806. Mr. Schutz.
Origins of the troubadour lyric. Its history, as to form and content, in the Eleventh and Twelfth Centuries. Elements of phonology and morphology.

804. Old Provençal. Three credit hours. Winter Quarter. General prerequisites must include French 803. Mr. Schutz.
Troubadour lyric in the Thirteenth Century. Increased attention to non-lyric genres, and to prose. Continuation of linguistics, with greater emphasis on semantic problems connected with the courtly terminology.

805. Middle French Literature. Three credit hours. Spring Quarter. General prerequisites must include French 813. Mr. Schutz.
Survey from about 1300 to 1465. Machaut, Froissart, Deschamps, Christine de Pisan, Charles d'Orléans, Villon. Anglo-French literary relations, with special reference to Chaucer.

811. Seminar in French Literature. Three to five credit hours. Autumn Quarter. General prerequisites must include three years of collegiate French and permission of the instructor. Mr. Havens.
Topic: Diderot's Correspondence.

812. Seminar in French Literature. Three to five credit hours. Winter Quarter. General prerequisites must include three years of collegiate French and permission of the instructor must be obtained. Mr. Demorest.
Topic: Comparison of Methods in Flaubertian Research.

813. Old French Literature. Three credit hours. Autumn Quarter. General prerequisites must include three years of collegiate French. Mr. Schutz.
Introduction to the reading of Old French. Reading and discussion of the *Chanson de Roland*, the *Yvain* of Chrétien de Troyes, representative lyrics and the *Tristan* of Béroul. Lectures on the main currents of Old French Literature.

817. Seminar in French Literature. Three to five credit hours. Spring Quarter. General prerequisites must include three years of collegiate French and the permission of the instructor must be obtained. Mr. Doolittle.
Topic: Racine.

880. Bibliography and Method. Three credit hours. Winter Quarter. Required of all graduate students specializing in French. Mr. Rockwood, Mr. Doolittle.

A course to acquaint graduate students with tools, problems and methods of linguistic and literary research.

950. Research in French Language or Literature. Autumn, Winter, and Spring Quarters. General prerequisites must include graduate standing in French. Professors, Associate and Assistant Professors.

This course is designed to meet the needs of individual graduate students who are pursuing a major study in the Department of Romance Languages.

ITALIAN

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

*611. Dante's Life and Works. Three credit hours. Winter Quarter. Given in alternate years. General prerequisites must include courses in modern Italian literature. Mr. Moore.

Reading of the *Vita Nuova* and the *Inferno*.

701. Minor Problems in Italian. One to five credit hours. Autumn, Winter, and Spring Quarters. General prerequisites must include permission of the instructor. Mr. Moore, Mr. Borelli.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

950. Research in Italian Language or Literature. Autumn, Winter and Spring Quarters. Mr. Moore, Mr. Borelli.

This course is designed to meet the needs of individual graduate students who are pursuing a major study in the Department of Romance Languages.

PORTUGUESE

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

*608. Types of Portuguese Literature. Three credit hours. Spring Quarter. Mr. Schutz.

A survey of Portuguese literature by genres. Attention will be given to Camoens, the romantic poets, Eça de Queiroz and others.

701. Minor Problems in Portuguese. Three to five credit hours. Autumn, Winter, and Spring Quarters. General prerequisites must include permission of the instructor. Mr. Schutz, Mr. Sapon.

SPANISH

407. Reading of Spanish. No credit. Autumn and Spring Quarters. Three meetings each week. No prerequisite. Not accepted as prerequisite for any other course in this department.

This course is open only to graduate students who wish to acquire a reading knowledge of Spanish, and is designed primarily for students who have had no formal preparation in this language.

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

605. Advanced Composition and Conversation. Three credit hours. Spring Quarter. General prerequisites must include a course in Spanish conversation and composition and a course in Spanish literature. Mr. Sapon.

This course is conducted wholly in Spanish. Its subject matter will be, for the most part, the history, customs, and manners of Spain and Spanish America.

607. The Spanish Novel of the Nineteenth Century. Five credit hours. Autumn Quarter. Four meetings each week, a fifth at the option of the instructor. Given biennially, alternating with Spanish 631. General prerequisites must include an introductory course in modern Spanish literature. Mr. Gilman.

* Not given in 1954-1955.

A study of the development of the modern Spanish novel, with particular attention to the works of Pérez Galdós.

608. The Modern Spanish Novel of the Twentieth Century. Five credit hours. Winter Quarter. Four meetings each week, a fifth at the option of the instructor. Given biennially, alternating with Spanish 610. General prerequisites must include an introductory course in modern Spanish literature. Mr. Pradal.

Works by Pío Baroja, Valle Inclán, Pérez de Ayala, Ramón Sender, and others.

*610. Modern Spanish Drama. Five credit hours. Winter Quarter. Four meetings each week, a fifth at the option of the instructor. Given biennially, alternating with Spanish 608. General prerequisites must include an introductory course in modern Spanish literature. Mr. Gilman.

The development of the Spanish drama in the late Nineteenth and Twentieth Centuries. Works of Benavente, Valle Inclán, Vaghi and García Lorca will receive special emphasis. Lectures, collateral reading, and reports.

*611. Drama of the Golden Age. Five credit hours. Winter Quarter. Four meetings each week, a fifth at the option of the instructor. Given in alternate years. General prerequisites must include an introductory course in modern Spanish literature. Mr. Anibal.

An intensive study of a limited number of plays of the representative dramatists, particularly Lope, Tirso, Alarcón and Calderón. Lectures, collateral reading, discussion and reports.

613. The Picaresque Novel. Five credit hours. Autumn Quarter. Four meetings each week, a fifth at the option of the instructor. General prerequisites must include an introductory course in modern Spanish literature. Mr. Pradal.

An intensive study of *Lazarillo de Tormes*, *Guzmán de Alfarache*, *El Buscón*, and *El diablo cojuelo*. Lectures, collateral reading, discussion, and reports.

615. Survey of Spanish Literature of the Twelfth to Sixteenth Centuries. Five credit hours. Winter Quarter. Four meetings each week, a fifth at the option of the instructor. Given in alternate years. General prerequisites must include an introductory course in modern Spanish literature. Mr. Rozzell.

Lectures, collateral reading, discussion, and reports.

*616. Survey of Spanish Literature of the Seventeenth and Eighteenth Centuries. Five credit hours. Spring Quarter. Four meetings each week, a fifth at the option of the instructor. Given in alternate years. General prerequisites must include an introductory course in modern Spanish literature. Mr. Pradal.

Lectures, collateral reading, discussion, and reports.

617. Modern Spanish Syntax. Five credit hours. Autumn Quarter. General prerequisites must include an intermediate course in Spanish conversation and composition and/or permission of the instructor. Mr. Anibal, Mr. Rozzell.

A course designed for advanced students who expect to teach Spanish. Appreciation of details, illustrated with composition and with analysis of contemporary texts. Discussion and reports on textbooks, on articles in periodicals, and particularly on Kany's *American Spanish Syntax*.

*618. Survey of Spanish Literature of the Sixteenth Century. Five credit hours. Spring Quarter. Four meetings each week, a fifth at the option of the instructor. Given in alternate years. Mr. Rozzell.

Lectures, collateral reading, discussion, and reports.

620. Spanish Pronunciation and Diction. Five credit hours. Winter Quarter. General prerequisites must include an introductory course in modern Spanish literature. This class is limited to twelve. Mr. Sapon.

Detailed study of special problems involved in teaching Spanish to English-speaking students. Analysis of differences between English and Spanish pronunciation.

* Not given in 1954-1955.

***621. Spanish Pronunciation and Diction.** Three credit hours. General prerequisites must include a course in Spanish conversation and composition and an introductory course in modern Spanish literature.

Detailed study of special problems. Analysis of differences between English and Spanish pronunciation.

623. Spanish Translating. Three credit hours. Spring Quarter. General prerequisites must include a course in Spanish conversation and composition. Mr. Rozzell.

This course gives training in translation from English to Spanish and from Spanish to English. This course is helpful in preparing for teaching or for military, diplomatic or other special service where exact linguistic knowledge is needed.

***631. Romanticism in the Hispanic World.** Five credit hours. Autumn Quarter. Four meetings each week, a fifth at the option of the instructor. Elective. Given biennially, alternating with Spanish 607. General prerequisites must include an introductory course in modern Spanish literature. Mr. Armitage.

A study of dramatists, poets, novelists and essayists designed to bring out the literary unity of the Hispanic world in the Romantic period. Larra, Espronceda, Sarmiento, Heredia, Zorrilla, Bécquer, Isaacs and others.

639. The Contemporary Spanish American Novel. Five credit hours. Spring Quarter. Four meetings each week, a fifth at the option of the instructor. General prerequisites must include an introductory course in modern Spanish literature. Mr. Armitage.

Recent development of the novel in the various regions of Spanish America. The *gaucho* novel, the *indianista* movement, and the influence of Naturalism. The novel of the Mexican Revolution, Gúraldes, Gálvez, Barrios, Alegría, Icaza, Rivera, Gallegos, Azuela, and others.

***640. Twentieth Century Spanish Literature.** Three credit hours. Autumn Quarter. General prerequisites must include an introductory course in modern Spanish Literature. Mr. Gilman.

The essayists and thinkers of the Generation of '98, including Unamuno, Azorín, Ortega y Gasset, and others. Lectures, collateral reading and reports.

***641. Contemporary Hispanic Poetry.** Five credit hours. Spring Quarter. General prerequisites must include an introductory course in modern Spanish literature. Mr. Pradal.

Currents of Spanish and Spanish American poetry from Ruben to Darío to García Lorca and Neruda.

645. Spanish Literature. Three to five credit hours. Spring Quarter. Five meetings each week. Students may secure credit under this course number not to exceed fifteen hours. General prerequisites must include an introductory course in modern Spanish literature. Senior staff.

Under this course number senior members of the department will conduct advanced studies of significant topics that are covered only briefly if at all in other offerings of the department.

701. Minor Problems in Spanish. One to five credit hours. Autumn, Winter, and Spring Quarters. Professors, Associate, and Assistant Professors.

NOTE: METHODS COURSES. See the Department of Education, Course 692.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading "DEPARTMENTS OF INSTRUCTION," page 51.

805. Old Spanish. Three credit hours. Autumn Quarter. General prerequisites must include not less than three years of collegiate Spanish and permission of the instructor. Mr. Schutz.

Principal constituents of old Spanish vocabulary. Elements of phonology and morphology.

* Not given in 1954-1955.

806. Old Spanish. Three credit hours. Winter Quarter. General prerequisites must include not less than three years of collegiate Spanish and permission of the instructor. Mr. Schutz.

Continuation of phonology and morphology. Some attention to semantics and to the schools and scholars of Spanish linguistics.

816. Seminar in Spanish Literature. Three to five credit hours. Autumn Quarter. Lectures, readings and reports. General prerequisites must include not less than three years of collegiate Spanish and permission of the instructor.

Topic: A Qualitative Analysis of Spanish Verse Forms.

817. Seminar in Spanish Literature. Three to five credit hours. Winter Quarter. Lectures, readings and reports. General prerequisites must include not less than three years of collegiate Spanish and permission of the instructor.

Topic: To be announced.

818. Seminar in Spanish Literature. Three to five credit hours. Spring Quarter. Lectures, readings and reports. General prerequisites must include not less than three years of collegiate Spanish and permission of the instructor. Mr. Anibal.

Topic: To be announced.

***819. The Spanish Drama of the Sixteenth Century.** Five credit hours. Spring Quarter. Four meetings each week, a fifth at the option of the instructor. Mr. Anibal.

The development of the National Theater: Juan del Encina, Gil Vicente, Torres Naharro, Lope de Rueda, Juan de la Oueva, Cervantes.

***821. Old Spanish Literature.** Three credit hours. Autumn Quarter. General prerequisites must include not less than three years of collegiate Spanish and permission of the instructor. Mr. Gilman.

A literary approach to medieval Spanish poetry the *Poema del Cid*, the *Libro de buen amor*, the *Poema de Fernán González* and poems by Berceo will be read. Selected prose passages will also be considered.

880. Bibliography and Method. Three credit hours. Winter Quarter. Required of all graduate students specializing in Spanish. Mr. Rozzell.

A course to acquaint graduate students with tools, problems, and methods of linguistic and literary research.

950. Research in Spanish Language or Literature. Autumn, Winter, and Spring Quarters. General prerequisites must include graduate standing in Spanish. Professors, Associate, and Assistant Professors.

This course is designed to meet the needs of individual graduate students who are pursuing a major study in the Department of Romance Languages.

RURAL ECONOMICS AND RURAL SOCIOLOGY

(See Agricultural Economics and Rural Sociology)

SCHOOL ADMINISTRATION

(See Education)

SOCIAL ADMINISTRATION

Office, 303 Stillman Hall

PROFESSORS McNEIL, MARK (EMERITUS), PATERSON (EMERITUS), RECKLESS, BATCHELOR, SHIMP, AND YOUNG, ASSOCIATE PROFESSORS BLACKBURN, HAMILTON, AND LIVINGSTON, ASSISTANT PROFESSORS JONES (EMERITUS), CORNELL, HOLMES, SCHWARTZ, AND GROTEWOHL, LECTURER LOUIS

GRADUATE CURRICULA IN SOCIAL ADMINISTRATION

The graduate curricula in Social Administration are designed to prepare students for professional positions in various fields of social work including community organization, social

* Not given in 1954-1955.

casework, social group work, corrections, rehabilitation of the handicapped, social research, and public welfare administration. Students whose general maturity, education and experience justify it, may be admitted to courses for which they are qualified without becoming candidates for a degree.

The several curricula offered by the School, and in fact the separate courses given, have been set up in acceptance of the proposition that the practice of social work is based on the social sciences. It is therefore to be desired that students entering upon professional training shall have had at least fundamental courses in psychology, economics, sociology, political science and history in their undergraduate work. Students desiring to become candidates for the Master of Arts degree in Social Administration should have at least thirty Quarter hours of work in the social sciences of which at least fifteen shall be a concentration in Sociology or an allied social science. Students having only minor deficiencies in meeting this requirement may be admitted to graduate work on condition that such courses as will meet these deficiencies be taken as soon as practicable and without credit toward the degree. The specific courses required to meet the deficiency will be determined by the Entrance Board and the Director of the School.

MASTER OF ARTS IN SOCIAL ADMINISTRATION

The Master's degree in Social Administration is the professional two-year graduate degree, requiring the equivalent of six Quarters of credit registration (15 hours each Quarter maximum), no more than three Quarters of which can be devoted to field work. A thesis is also required. The student presenting himself for this degree must show in addition to academic qualifications personal suitability for professional social work. These qualifications are reviewed regularly by the faculty during the period of graduate work.

Each student preparing for the Master of Arts in Social Administration must take courses covering the basic preparation for graduate professional social work. In addition he is expected to major in one area of specialization in social work. The program of study for each student, including the basic overall preparation and the preparation in one area of study and training, will be arranged by the student's major faculty adviser.

FIELD INSTRUCTION

An indispensable part of professional education for social work is supervised field instruction. The student is placed in an agency of recognized standards where skilled supervision is assured. Field instruction provides the student opportunity to apply and test the principles and methods with which he has become familiar through study and classroom discussion. Field instruction, therefore, is not job experience or practice but an individualized educational experience integrated into the total preparation for professional social work.

Field instruction concurrent with course work as well as full time or "block" field instruction will be available.

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

621. Principles of Probation and Parole. Four credit hours. Winter Quarter. General prerequisites must include Sociology 625. Mr. Reckless.

A study of how offenders are placed and supervised on probation and parole.

Not open to graduate students in social administration.

627. Juvenile Delinquency and Its Treatment. Five credit hours. Spring Quarter. Mr. Reckless.

Juvenile delinquency as a social problem. Methods of treatment and prevention, including juvenile courts, clinics, probation, parole, correctional institutions, child placement, and recreational programs.

Not open to graduate students in social administration.

***630. The Veteran and His Family.** Three credit hours. Winter Quarter. Mr. Blackburn.

A study of the social welfare problems encountered by the veteran or service man and his family together with a presentation of the social services available for meeting such needs. Special attention to current developments and unmet needs.

Not open to graduate students in social administration.

637. Social Implications in Rehabilitation. Three credit hours. One Quarter. Autumn and Winter. Mr. Hamilton.

The significance of disability and employability in their social, medical, and industrial applications; rehabilitation as a process; current concepts.

Not open to students who have credit for Social Administration 510.

Not open for graduate credit to students majoring in Rehabilitation.

* Not given in 1954-1955.

640. Social Statistics. Three credit hours. Spring Quarter. Two class meetings and one two-hour laboratory period each week. General prerequisites must include a course in Social Investigation and Social Statistics. Mr. Cornell.

Analysis of frequency distribution; measures of reliability and significance; simple correlation; sampling problems. Use of graphic and mechanical aids in statistical problems will be discussed.

647. Direction of Group Activities. Three credit hours. One Quarter. Autumn and Winter. Lectures, readings, practical demonstrations, field trips. General prerequisites must include courses in Introductory and Educational Sociology or the equivalent. Sociology 645 is strongly recommended as a preceding or concurrent course. Mr. Batchelor, Mr. Schwartz, Miss Grotewohl.

Consideration of program problems in the practice of group leadership. Instruction and practice in use of games, stories, music, dramatics, crafts and other program resources. Field trips are required.

Not open to graduate students in social administration.

648. Organization of Camps and Other Specialized Group Programs. Three credit hours. Spring Quarter. Lectures, readings, demonstrations and field observation. General prerequisites must include Sociology 645 and Social Administration 601, or equivalent. Mr. Batchelor, Mr. Schwartz, Miss Grotewohl.

Consideration of various forms of special group agency programs such as summer camps, day camps and vocational schools as conducted by social settlements and churches. Particular attention is given to the adaptation of these activities to the national programs of the Y.M.C.A., Y.W.C.A., Boy Scouts, Girl Scouts and Camp Fire Girls.

650. Group Leadership Methods. Three credit hours. One Quarter. Autumn and Winter. Prerequisite, Sociology 645. Mr. Batchelor, Mr. Schwartz, Miss Grotewohl.

An analysis of the purpose, characteristics and use of group leadership. Consideration of the leadership methods of the principal agencies in this field such as settlements, the Y.M.C.A., the Y.W.C.A., Boy Scouts, Girl Scouts, and Camp Fire Girls.

Not open to graduate students in social administration.

652. Supervisory Problems in Youth Leadership and Recreation. Three credit hours. Winter Quarter. Prerequisite, Sociology 645 and Social Administration 650 or the equivalent. Mr. Batchelor.

Supervisory and departmental practices in the settlement, Y.M.C.A., Y.W.C.A., Boy and Girl Scouts, Camp Fire Girls, and similar organizations. Consideration of methods of recruiting, selection, training, supervision, and guidance of professional and volunteer personnel.

Not open to graduate students in social administration.

656. Development, Organization, and Administration of Group Work Agencies. Three credit hours. Autumn Quarter. General prerequisites must include Sociology 645, Social Administration 650 or the equivalent. Given in alternate years. Mr. Batchelor.

The historical development and current methods of organization and administration of nationally organized group work agencies.

661. The Individual and the Social Agency. Three credit hours. One Quarter. Autumn, Winter, Spring. Three lecture and recitation periods each week. General prerequisites must include a course in introductory sociology. Mrs. Holmes.

The study and evaluation of social and environmental and psychological conditions as they affect the individual in his use of social welfare resources.

Not open to graduate students in social administration.

670-671. Community Health Organization. Two credit hours each. Spring Quarter. Mr. Louis.

The aims and historical developments of public health, with particular reference to England and the United States of America.

679. Legal Aspects of Social Work. Three credit hours. One Quarter. Autumn and Winter. Mr. Blackburn.

Discussion of the law as a means of social control; study of case law and statutes relating to those fields of the law which are of greatest concern to the social worker; the legal aid movement in the United States.

701. Social Welfare Problems and Services. Two credit hours. One Quarter. Autumn and Winter. Open only to graduate students. All instructors.

The evolution and development of social work as a profession, its philosophy, principles and objectives. The study of current governmental and voluntary social welfare programs, their historical development and progress toward meeting the individual and social needs for which they were designed.

702. Social Work Concepts and Processes. Two credit hours. One Quarter. Autumn and Winter. Open only to graduate students. All instructors.

An examination of the basic concepts and processes common to all social work. Case material is used to illustrate the interrelatedness of processes used in case work, group work and community organization settings, as these processes are applied to the needs and problems of individuals, groups and communities.

703. Problems and Programs in Public Health and Medical Care. Two credit hours. Autumn Quarter. Open only to graduate students. Mr. Hamilton.

An examination of the resources and problems in the field of public health and medical care; emphasis on those aspects of particular importance to the social worker in relationship to social welfare; structure and practice of organized medicine; public health and preventive medicine, industrial hygiene; interrelationship of voluntary and governmental agencies in public health and public welfare.

704. The Field of Corrections. One credit hour. One Quarter. Winter and Spring. Open only to graduate students. Mr. Reckless.

An analysis of the basic operations in authoritarian settings, such as probation, correctional institutions, and parole.

705. Psychiatric Aspects of Social Work I. Two credit hours. One Quarter. Autumn, Winter, Spring. Open only to graduate students. Miss Young.

The influence of modern psychiatry upon social work practice. Attention appropriate to the social worker is given to the development and functioning of emotional life and to the dynamics of behavior.

Not open to students who have credit for Social Administration 827.

706. Psychiatric Aspects of Social Work II. Two credit hours. Winter Quarter. Open only to graduate students. General prerequisites must include Social Administration 705.

The influence of modern Psychiatry upon social work practice. Attention appropriate to the social worker is given to the development and functioning of emotional life and to the dynamics of behavior.

720. Research Methods in Social Work. Three credit hours. One Quarter. Autumn and Spring. Open only to graduate students. Mr. Blackburn, Mr. Cornell.

A course designed to prepare students to do independent social research.

Not open to students who have credit for Social Administration 680.

721. The Interpretation of Social Statistics. Two credit hours. Spring Quarter. Open only to graduate students. General prerequisites must include Social Administration 720. Mr. Blackburn, Mr. Cornell.

A course designed to give facility in the use of pertinent methods of statistical analysis and in the effective presentation of statistical facts.

Not open to students who have credit for Social Administration 681.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

800. Seminar in Social Work. One to four credit hours. Autumn, Winter and Spring Quarters. Open to graduate students who are majors in Social Administration or who have special interest in this field. All instructors.

Lectures, reports and group discussion under the following headings:

- (a) Corrections
- (b) Social Group Work
- (c) Public Welfare Administration
- (d) Social Research
- (e) Social Casework
- (f) Community Organization
- (g) Rehabilitation of the Handicapped

801. Special Problems. One to five credit hours. All Quarters. This course may be repeated to a total of fifteen credit hours. General prerequisites must include graduate standing and permission of the instructor.

Registration for this course number shall be followed by a letter designating the field of study.

Individual projects in some field of social work:

- | | |
|-----------------------------------|---------------------------------------|
| (a) Corrections | (e) Social Casework |
| (b) Social Group Work | (f) Community Organization |
| (c) Public Welfare Administration | (g) Rehabilitation of the Handicapped |
| (d) Social Research | (h) Other areas |

814. Cooperative Planning and Financing for Social Welfare. Two credit hours. Winter Quarter. General prerequisites must include Social Administration 701, 702, and 705, or the equivalent and permission of the instructor. Mr. McNeil, Mr. Shimp.

Treats in detail the technical aspects of the organization, philosophy, management and operation of community chests and councils. Consideration given to other local, state, and national agencies concerned with federated financing and planning.

815. Interpretation of Social Work. Two credit hours. Spring Quarter. General prerequisites must include 830 or the equivalent and permission of the instructor. Mr. Shimp.

The place of education in a social work program. The message and the method of educational publicity.

816. Social Casework I. Two credit hours. One Quarter. Winter and Spring. General prerequisites must include Social Administration 701, 702, and 705, or the equivalent and permission of the instructor. Miss Young, Mrs. Holmes.

The principles and methods of social case work and their application; case records used for study and discussion.

817. Social Casework II. Two credit hours. Winter Quarter. General prerequisites must include Social Administration 816. Miss Young, Mrs. Holmes.

The principles and methods of social casework and their applications; case records used for study and discussion.

818. Casework in Medical Settings. Two credit hours. Spring Quarter. General prerequisites must include Social Administration 816.

Consideration of some basic factors involved in the carrying out of casework treatment plans. Deals with the differential coordination in each case of the client's needs, the case worker's abilities, and her agency's limitations. Case material extensively used.

819. Casework in Psychiatric Settings. Two credit hours. Spring Quarter. General prerequisites must include Social Administration 816.

Consideration of some basic factors involved in the carrying out of casework treatment plans. Deals with the differential coordination in each case of the client's needs, the caseworker's abilities, and her agency's limitations. Case material extensively used.

Not open to students who have credit for Social Administration 861.

***820. Interviewing in Social Casework.** Three credit hours. Spring Quarter. General prerequisites must include Social Administration 818. Miss Young.

A course to assist the student in acquiring facility in interviewing. Attention is directed toward understanding the caseworker-client relationship and toward appreciating the variables entering into interviews.

* Not given in 1954-1955.

821. Community Planning for Child Care. Two credit hours. Spring Quarter. General prerequisites must include Social Administration 816. Mr. Shimp.

Critical examination of child care programs, including both voluntary and governmental agencies. The place of such programs in a community welfare scheme as affected by state control or regulation. Influence of state regulations in developing standards of care in relation to children in their own homes, in institutions, or in foster homes.

Not open to students who have credit for Social Administration 620.

822. Social Work Approach to Juvenile Delinquency. Two credit hours. One Quarter. Winter and Spring. General prerequisites must include Social Administration 701, 702, and 705, or the equivalent and permission of the instructor. Mr. Reckless.

An examination of the philosophies, approaches, and policies operating in programs which attempt to treat and prevent delinquency.

823. Substitute Parental Care. Two credit hours. Spring Quarter. General prerequisites must include Social Administration 816. Miss Young.

Consideration of the principles and methods of foster home placement including determination of need for placement, preparation and participation of child selection of substitute care, foster home or institution, and follow-up. Basic casework concepts are applied to this specialized setting.

825. Medical Aspects of Social Work. Two credit hours. Autumn Quarter. General prerequisites must include Social Administration 701 and 702, or the equivalent and permission of the instructor. Medical lecturers. Mr. Hamilton.

Presentation of medical knowledge about disease and disability, emphasizing symptoms, diagnosis, treatment and convalescent care. The social implication of disease and disability is stressed.

829. The Vocational Adjustment of the Handicapped. Three credit hours. Spring Quarter. General prerequisites must include Social Administration 701, 702, and 705, or the equivalent and permission of the instructor. Mr. Hamilton.

The rehabilitation approach to the disabled individual. The emphasis of counseling on the analysis and amelioration of the total handicap. Techniques and devices.

Not open to students who have credit for Social Administration 633.

830. Community Organization. Two credit hours. One Quarter. Winter and Spring. General prerequisites must include Social Administration 701, 702, and 705, or the equivalent and permission of the instructor. Mr. McNeil, Mr. Shimp.

A study of the methods by which a social worker may assist in developing and maintaining his agency's service in the community and by which he may play a significant part in developing a progressive social program in the community. Attention given to methods for analyzing community needs, to the problem of inter-relating agencies, both public and private, in meeting these needs, and to the securing of community interest in and understanding of social work.

***831. Administrative and Community Relations in Rehabilitation.** Three credit hours. Winter Quarter. Mr. Hamilton.

Administrative aspects of rehabilitation. Community effort to integrate medical, social, and vocational diagnoses and treatment. Functional interrelationships of agencies, public and private, at federal, state, and local levels. Consideration of factors in the optimum program.

Not open to students who have credit for Social Administration 632.

832. Problems and Programs in Rehabilitation. Two credit hours. Winter Quarter. General prerequisites must include Social Administration 825 and 829 or the equivalent, and permission of the instructor. Mr. Hamilton.

A consideration of problems presented by disability categories with special emphasis on the tuberculous, the cardiac, the orthopedically disabled child, the severely handicapped, the blind, the deaf and the hard of hearing. In-institutional rehabilitation programs, sheltered employment, the community rehabilitation center.

***833. Medical Implications in Rehabilitation.** Three credit hours. Spring Quarter. Medical lecturers. Mr. Hamilton.

* Not given in 1954-1955.

Disability and physical restoration. The types of medical problems commonly presented by the handicapped.

Not open to students who have credit for Social Administration 631.

834. Case Studies in Rehabilitation. Three credit hours. Spring Quarter. General prerequisites must include Social Administration 825 and 829 or the equivalent, and permission of the instructor. Mr. Hamilton.

A critical analysis of representative rehabilitation cases.

Not open to students who have credit for Social Administration 636.

***836. National Social Work Agencies and Local Programs.** Three credit hours. Winter Quarter. General prerequisites must include Social Administration 814. Open by consent of the instructor. Mr. McNeil.

Their historical development and influence. Contractual relations. Promotion. Education. Specialism. Standards.

837. Financing and Budgeting Social Welfare Services. Two credit hours. Spring Quarter. General prerequisites must include Social Administration 830. Mr. McNeil, Mr. Shimp.

Social Welfare program in terms of dollars. Costs of social welfare services. Principles and methods of agency and community budgeting. Principles and methods in joint financing.

840. Techniques in Probation and Parole Work. Two credit hours. Spring Quarter. General prerequisites must include Social Administration 704, Social Administration 816, or the equivalent and permission of the instructor. Mr. Reckless.

A survey of the specific policies and skills in making probation and parole investigations, and in supervising probationers and parolees. Consideration of the differential services required for juvenile and adult offenders.

841. Public Welfare Administration. Two credit hours. One Quarter. Winter and Spring. General prerequisites must include Social Administration 701, 702, and 705. Mr. Livingston, Mr. Shimp.

Principles in the administration of welfare activities by departments of government, local, state and federal. Emphasis on administrative problems of personnel, finance, public relations and social planning in relation to family welfare and child care.

843. The Administration of Social Work Agencies. Two credit hours. One Quarter. Winter and Spring. General prerequisites must include Social Administration 701, 702, and 705. Mr. Livingston, Mr. Shimp.

An introduction to the basic factors in the administration of social agencies.

844. Social Security Systems—United States and Foreign. Two credit hours. Spring Quarter. General prerequisites must include Social Administration 841, or the equivalent and permission of the instructor. Mr. Livingston.

A study of Social Security systems with special reference to the United States. Emphasis is given to the public assistance phases of such programs.

Not open to students who have credit for Social Administration 678.

847-848-849. Research in Penology. One to four credit hours. Autumn, Winter, and Spring Quarters. Open on consent of the instructor. It is assumed that the student who takes this course shall have had one year's work in criminology and penology. Mr. Reckless.

852. Supervision in Social Group Work. Two credit hours. Winter Quarter. General prerequisites must include Social Administration 863, 864, and 865. Mr. Batchelor, Mr. Schwartz, Miss Grotewohl.

An examination of the nature and function of the supervisory process in the practice of group work. An analysis of concepts and methods of group work supervision as they apply to personnel practices and to the process of staff development and growth.

853. Coordination of Youth Services and Recreation. Two credit hours. Spring Quarter. Mr. Batchelor.

* Not given in 1954-1955.

Principles, methods and problems involved in the coordination of voluntary and tax-supported recreational services with public education and with youth services and other leisure time resources.

855. Public Recreation: Its Organization and Administration. Two credit hours. Autumn Quarter. Mr. Batchelor.

Consideration of the common patterns of organization of community recreation found in American cities, large and small, under municipal, school and other auspices, and the administrative functions involved.

857-858-859. Seminar in Social Work Research and Statistics. One to three credit hours. Autumn, Winter, and Spring Quarters. General prerequisites must include Social Administration 720, 721 or equivalent, and consent of the instructor. Students may enter any Quarter. Mr. Blackburn, Mr. Cornell.

Critical examination of the problems of planning and administration of social work research projects. Consideration will be given to such topics as delimitation of inquiry; methods of sampling and selection; drafting of outline of report; schedules, questionnaires, and other forms for collecting data; administrative controls in the office and field; systems of coding and of tabulating data with standard electrical tabulating equipment. Evaluation of methods and findings of selected studies in the field of social work.

860. Program Materials and Methods in Social Group Work. Two credit hours. Spring Quarter. General prerequisites must include Social Administration 816 and 863 or the equivalent and permission of the instructor. Mr. Batchelor, Mr. Schwartz, Miss Grotewohl.

A course dealing with a group worker's choice and selective use of program materials and techniques. Emphasis is given to the organization, content, meaning, and application of program areas for various age levels and for various specialized settings.

862. Psychiatric Applications in Social Work. Two credit hours. Spring Quarter. General prerequisites must include Social Administration 817 and permission of the instructor.

Application by the social case worker of psychiatric understanding and treatment to more severe problems of emotional disturbances.

863. Social Group Work I. Two credit hours. One Quarter. Winter and Spring. General prerequisites must include Social Administration 701, 702, and 705. Mr. Batchelor, Mr. Schwartz, Miss Grotewohl.

Principles and concepts of social group work as a method of social work are examined and the student is helped to understand the leader's role in enabling members of a group to use the group experience for personal growth and development of social responsibility. The interrelations of social group work to the other areas of social work practice are discussed.

Not open to students who have credit for Social Administration 653.

864. Social Group Work II. Two credit hours. One Quarter. Winter and Spring. General prerequisites must include Social Administration 863. Mr. Batchelor, Mr. Schwartz, Miss Grotewohl.

Discussion on advanced level of the role of the leader in affecting the group process to meet the needs of individuals in the group and to attain social objectives. Group records used for study and discussion.

Not open to students who have credit for Social Administration 654.

865. Social Group Work III. Two credit hours. Autumn Quarter. General prerequisites must include Social Administration 860, 863, 864, or the equivalent. Mr. Batchelor, Mr. Schwartz, Miss Grotewohl.

Advanced study of social group work theory and practice, with emphasis upon application of the group work method in special settings and the influence of setting on practice; group work and social action; and the interpretation and integration of social group work in the total community pattern of health and welfare services.

875. Field Instruction. One to fifteen credit hours. Summer, Autumn, Winter, and Spring Quarters. Open only to graduate students in Social Administration. Each field placement must be arranged in consultation with student's faculty adviser. All instructors.

This course provides practical experience in application of the principles, skills and techniques in the various areas of social administration under the direction of the School of Social Administration and the immediate supervision of selected social agencies. Complete reports of the student's field instruction are required.

876. Treatment Programs in Correctional Institutions. Two credit hours. Winter Quarter. General prerequisites must include Social Administration 701, 702, 704 and 705, or the equivalent and permission of the instructor. Mr. Reckless.

A monographic analysis of outstanding correctional institutions for juvenile and adult offenders.

877. The Function and Operation of Welfare Institutions. Two credit hours. Spring Quarter. General prerequisites must include Social Administration 841 or the equivalent and permission of the instructor. Mr. Livingston.

Growth and expansion of welfare institutions. Composition of institutional population. Analysis of programs. Problems of personnel and management. The impact and results of institutional care.

878-879-880. Research in Rehabilitation. One to four credit hours. Autumn, Winter, and Spring Quarters. Permission of the instructor required. Mr. Hamilton.

It is assumed that the student undertaking this work shall have completed at least one year's employment in the field of rehabilitation or in an allied field.

881. Advanced Community Organization. Two credit hours. Winter Quarter. General prerequisites must include Social Administration 830. Mr. McNeil, Mr. Shimp.

A study of the role of the professional worker in setting standards and goals; the techniques of committee operation, record keeping, and evaluation of community progress in building balanced social welfare programs; the process of assisting citizens to join efforts for effective community improvement.

882. Seminar in Rural Community Organization. One to three credit hours. Spring Quarter. General prerequisites must include Social Administration 830 or experience in a rural community and permission of the instructor. Mr. Shimp.

Analysis of problems relating to development of social welfare and related services indigenous to the rural community.

883. Advanced Seminar in Social Work. One to four credit hours. Autumn, Winter, and Spring Quarters. Open only to students who have completed one year of graduate study in Social Administration. All instructors.

Lectures, reports and group discussion on current trends and special problems in social work.

899. Interdepartmental Seminar. One to five credit hours. All Quarters. When two or more departments desire to establish a departmental seminar on a subject of common interest, the chairman or authorized representatives of the departments concerned shall prepare a course description including the names of the faculty members designated to conduct the seminar. The statement shall be submitted to the Executive Committee of the Graduate School for prior approval.

950. Research in Social Administration (Thesis and Seminar). Credit hours to be arranged. Autumn, Winter, and Spring Quarters. All instructors.

Individual projects selected and developed in consultation with a faculty adviser.

SOCIOLOGY AND ANTHROPOLOGY

Office, 112 Hagerty Hall

PROFESSORS SLETTTO, DENUNE (EMERITUS), LUMLEY (EMERITUS), NORTH (EMERITUS), BATCHELOR, BERRY, CUBER, MANGUS, OYLER, AND RECKLESS, ASSOCIATE PROFESSORS BENNETT, ROBBINS, SEEMAN, AND WOLFF, ASSISTANT PROFESSORS BULLOCK, ESTEL, JONASSEN, AND NISSEN

In the field of general sociology the M.A. and Ph.D. degrees are offered. It is expected that the student will have secured the M.A. degree prior to becoming a candidate for the Ph.D. degree. The doctoral candidate must be competent in two major and three minor fields of sociology; one of the majors must be either research methodology or theory. The M.A. candidate

is expected to take certain core subjects as basic preparation, but it is also expected that he will follow an interest in one field of sociology and that he will write his thesis in this field of interest.

The fields of sociological study, as represented by the specialized interests of the staff members of the department are as follows: theory, race relations, social organization and planning, the family, criminology and penology, educational sociology, recreation and leadership, social psychology, urban sociology and ecology, and research methodology.

Anthropology, as represented in the department, covers work in four focal areas: physical anthropology, archaeology, ethology, and social anthropology. The M.A. degree is offered in anthropology. The student is expected to take a core curriculum but he may develop his interest in any one of the focal areas. Anthropology may be used as a major toward the Ph.D. degree in sociology.

The department is developing certain unusual research opportunities. In recent years, a considerable amount of contract research has been undertaken by departmental members, which presents opportunities for participation of advanced students. The department is developing foreign area research projects in both anthropology and sociology. The department also presents unusual opportunities for students interested in the marriage and family area. It operates a marriage clinic for the training of teachers of marriage and family courses in American colleges and universities and for training in counseling, incidental to the conduct of such courses.

It is possible for M.A. students to receive specialized training in two increasingly important practical areas of applied sociology: namely, penology and corrections and recreation leadership and administration. These two practical specializations are designed for persons who want graduate preparation for careers in probation, parole and correctional administration, on the one hand, and in Boys' Club, Boy Scout, YMCA, community recreation work and similar fields on the other hand, where the professional degree in social work is not required.

Students interested in a particular area should consult the staff member indicated:

The general program of graduate study in sociology—Mr. Sletto, Chairman of the Department.

Anthropology—Mr. Bennett.

Marriage and Family, and Marriage Clinic—Mr. Oyler.

Penology and Corrections—Mr. Reckless.

Recreation Leadership and Administration—Mr. Batchelor.

AREAS

Sociology, page 333

Anthropology, page 336

SOCIOLOGY

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

600. The Modern Family. Four credit hours. One Quarter. Autumn. Winter, Spring. Mr. Oyler, Mr. Mangus, Mr. Nissen.

An examination of the results of the impact of modern culture upon the family with special reference to such factors as size of family, member relationships, economic problems, divorce, desertion, status of women.

601. Types of Family Organization. Four credit hours. Winter Quarter. General prerequisites must include Sociology 600. Mr. Oyler.

A survey of family organization from primitive times to the present; an analysis of the factors that entered into their development.

602. Marriage Education Programs in the United States. Three credit hours. Spring Quarter. General prerequisites must include Sociology 600. Mr. Oyler.

A critical examination of programs designed for the preparation for family life in the United States.

604. Race Problems. Three credit hours. One Quarter. Autumn and Winter. Mr. Berry.

A survey of the problems arising from the contacts of peoples who differ as to race and culture.

605. American Minority Groups. Three credit hours. Spring Quarter. General prerequisites must include Sociology 604. Mr. Berry.

A study of the cultural background distribution, assimilation and other adjustments of selected minority groups.

614. The Community. Four credit hours. Autumn Quarter. Four class meetings each week. Mr. Jonassen.

Population patterns and changes, ecological processes, institutional organization and dis-organization, community zones, sub-areas and their social characteristics.

Not open to students who have credit for Sociology 514.

622. Social Factors in Personal Adjustment. Three credit hours. Autumn Quarter. Mr. Seeman.

Nature of human nature; process of socialization; social change and individual demoralization; social roles in conflict situations; re-direction of social activity.

623. Collective Social Behavior. Three credit hours. Winter Quarter. Mr. Seeman.

A study of the kinds of mass action arising in crowds, mobs, strikes, audiences and the public. Problems and techniques of study and control.

624. Culture Patterns and Personality. Three credit hours. Spring Quarter. Three lecture periods each week. General prerequisites must include Sociology 623, or a course in social psychology, or the equivalent. Mr. Bennett.

The distinctive anthropological contributions to the general field of social psychology. Variations in personality as associated with variations in culture. The range of personality differences within various cultures.

625. Criminology. Five credit hours. One Quarter. Autumn, Winter, Spring. Mr. Dimitz.

The nature, variation and causes of crime and delinquency. Studies of criminal liability, criminal careers, and organized crime and racketeering.

626. Penology. Four credit hours. Autumn Quarter. General prerequisites must include Sociology 625. Mr. Reckless.

The handling and treatment of adult offenders by courts, jails, reformatories, prisons, probation, and parole.

Not open to students who have credit for Social Administration 626.

629. General Sociology. Four credit hours. Autumn Quarter. General prerequisites must include thirty hours in not more than two allied subjects. Mr. Cuber.

A critical examination of the more fundamental ideas and concepts of modern scientific sociology.

645. Leisure and Recreation. Four credit hours. One Quarter. Autumn and Spring. Mr. Batchelor, Mrs. Robbins.

The sources of leisure in early and modern society. The social significance and uses of leisure. The social functions of play. Historical aspects of play. The recreation problem of modern communities from the standpoint of control and of public provision.

661. Social Causation. Three credit hours. Autumn Quarter. Mr. Wolff.

A theory of social causation and analyses of selected cases of social causation. Text, class reports, projects.

662. Social Change. Three credit hours. Winter Quarter. Mr. Wolff.

A theory of social change and analyses of selected cases of social change. Text, class reports, projects.

663. Social Control. Three credit hours. Spring Quarter. Mr. Wolff.

A theory of social control and analyses of selected cases of social control. Text, class reports, projects.

676. Social Classes. Four credit hours. Autumn Quarter. Four class meetings each week. Mr. Cuber.

Class distinctions as a phase of social differentiation. The origin and characteristics of social classes. The significance for modern society of class consciousness, class struggle, and social mobility.

677. Social Organization in a Changing World. Four credit hours. Winter Quarter. Four class meetings each week. Mr. Cuber.

An examination of the adaptability of present institutional organization to the situation created by world reorganization. The impact of world problems upon American culture. Implications of democracy for social reconstruction.

678. The School and the Community. Three credit hours. Autumn Quarter. Mr. Jonassen.

A study of the school as a social institution in the American community. The sociological importance of community structures, processes and problems in determining school-community relationships.

680. Social Orientation of Children. Four credit hours. Winter Quarter. Three class sessions each week and one hour for field study of a child group. Mrs. Robbins.

A study of the ways in which society socializes children, with parallels from more stable or less complex cultures. Current breakdowns in the socializing process and implications from the school and other educational agencies.

700. Special Problems. One to four credit hours. All Quarters. General prerequisites must include ten hours of sociology, senior standing, and permission of the instructor. Assigned readings or individual research, informal conferences and written reports. Registration for this course number should be followed by a letter designating the field of sociological study.

- | | |
|--------------------------------------|--------------------------|
| (a) Sociological Theory | (g) Social Psychology |
| (b) Social Organization and Planning | (h) The Family |
| (c) Anthropology | (i) Research Methodology |
| (d) Criminology and Penology | (j) Urban Sociology |
| (e) Educational Sociology | (k) Unclassified |
| (f) Race Relations | |

705. Introduction to Sociological Research. Four credit hours. Autumn Quarter. General prerequisites must include a course in elementary statistics, and senior standing. Mr. Bullock.

Delineation of a research problem in sociology. Uses of available sources of data. Sampling procedures of sociological research. Field methods for collecting original data. Sociometric instruments.

Not open to students who have credit for Sociology 800.

706. Methods of Social Measurement. Four credit hours. Winter Quarter. General prerequisites must include Sociology 705 or Social Administration 680. Mr. Sletto.

A critical evaluation of social surveys, areal and regional studies, the ecological approach, sociometric studies, prediction of outcome, and case study methods.

Not open to students who have credit for Sociology 890.

707. Experimental Design in Sociological Research. Four credit hours. Spring Quarter. Four class meetings each week. General prerequisites must include Sociology 705 or Social Administration 680, and elementary statistics. Mr. Sletto.

Analysis of the use of special sampling procedures, control groups, replication, and validation of research findings.

725. Control and Prevention of Crime and Delinquency. Four credit hours. Autumn Quarter. Two two-hour lecture periods each week. General prerequisites must include Sociology 625. Mr. Reckless.

Analysis of the operational effectiveness of special measures and programs pointed toward the control and prevention of crime and delinquency.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

All candidates for degrees are required to register for Sociology 705 or Social Administration 845-846.

***801-*802-*803. Development of European Sociology.** Three credit hours. Autumn, Winter, and Spring Quarters. Readings, reports, lectures, and discussions. Mr. Wolff.

A survey of the most important literature representing the development of European sociology.

* Not given in 1954-1955.

805-806-807. Development of American Sociology. Three credit hours. Autumn, Winter, and Spring Quarters. Readings, reports, lectures, and discussions. Mr. Wolff.

An intensive study of the theories concerning the origin, development, forms and nature of society, advanced by the leading American sociologists.

***827. Nationality and Nationalism.** Four credit hours. Autumn Quarter. A survey of the religious, economic, political, and social backgrounds which underlie the contemporary development of national attitudes.

***861-*862-*863. Social Planning and Reconstruction.** Two credit hours. Autumn, Winter, and Spring Quarters. Mr. Cuber.

The nature of social organization and disorganization and their relation to the total life of a society. Types of institutional patterns. Problems involved in efforts to effect purposive change. Gradualism and Revolution as modes of social reconstruction. A critical examination of the more prominent efforts at social planning in America and elsewhere.

Not open to students who have credit for Sociology 860.

***864. Advanced Criminology.** Four credit hours. Spring Quarter. General prerequisites must include Sociology 625 or its equivalent. Mr. Reckless.

Intensive study of the most important aspects of criminology.

899. Interdepartmental Seminar. One to five credit hours. All Quarters. When two or more departments desire to establish an interdepartmental seminar on a subject of common interest, the chairmen or authorized representatives of the departments concerned shall prepare a course description including the names of faculty members, designated to conduct the seminar. The statement shall be submitted to the Executive Committee of the Graduate School for prior approval.

900. Seminars in Sociology. One to four credit hours each Quarter. The different members of the department teaching staff who are qualified to offer graduate courses will organize seminars from time to time in their respective fields of specialization. Those fields are listed under the description of Sociology 700, and registration in Sociology 900 should be followed by an alphabetic letter indicating the field of the seminar.

950. Research in Sociology. All Quarters. Reserved exclusively for thesis credit toward advanced degrees. Credit per Quarter to be decided upon in consultation with the student's major adviser. Registration in Sociology 950 should be followed by an alphabetic letter designating the field of sociology in which the thesis is being done. These fields are listed in description of Sociology 700.

ANTHROPOLOGY

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51. Students may also register under Sociology 700, for special project work in anthropology.

607. Acculturation and Culture Conflict. Four credit hours. Spring Quarter. Mr. Bennett, Mrs. Bourguignon.

A study of the origins and nature of change and conflict within and among cultures. Special emphasis is placed upon the effects on simpler societies of the world-wide diffusion of Euro-American culture. Problems in the administration of native peoples and minority group conflicts are studied as case material.

***612. Social Organization of Preliterate Peoples.** Three credit hours. Autumn Quarter. Given in alternate years. Mr. Bourguignon.

The development of forms of social organization in simpler societies; the dynamics of social relations in such societies; a comparison of simpler forms of social structure with complex forms.

613. Religion in Simpler Societies. Four credit hours. Winter Quarter. Mr. Bennett, Mrs. Bourguignon.

* Not given in 1954-1955.

A study of the ideas and way of life of simpler peoples, preliterate and contemporary, with emphasis on religion and sacred beliefs, and the relationship of these beliefs to social organization.

630. Indians of North America. Three credit hours. Spring Quarter. May be taken in a two-course sequence with Sociology 632. Mr. Bennett.

A survey of American Indian cultures in their tribal state at the time of European conquest, with a briefer study of the Indian as a minority group in Modern America. Motion pictures and slides.

***632. North American Indian Prehistory.** Four credit hours. Autumn Quarter. Mr. Bennett, Mr. Estel, Mr. Baby.

A survey of American Indian archaeology: The origin and development of Indian culture north of Mexico from the first peopling of the continent to the coming of the Europeans. Motion pictures, slides, museum study.

633. Dynamics of American Culture. Three credit hours. Autumn Quarter. Mr. Bennett.

A review of social scientific analyses of American customs, institutions, social systems, and ideas with emphasis on recent cultural anthropological studies.

634. Ethnology of Asia. Four credit hours. Winter Quarter. Four lecture periods each week. Mr. Bennett.

A study of the living peoples of Asia. Emphasis is placed on the non-literature cultures, but the high civilizations also will be considered.

635. Ethnology of Africa. Four credit hours. Autumn Quarter. Four lecture periods each week. Mrs. Bourguignon.

A survey of the peoples and cultures south of the Sahara; the distribution of physical types, languages, and cultures in Africa. A discussion of art forms; economic, social, political and religious institutions in native Africa. Motion pictures, slides and recordings.

Not open to students who have credit for Sociology 504.

636. Fossil Man. Four credit hours. Winter Quarter. General prerequisites must include an introduction to physical anthropology or fifteen hours of biology or geology. Mr. Estel.

A comprehensive study of the fossil hominids. The description, dating, and distribution of fossil pre-hominid and hominid primates. Fossils of *Homo sapiens* and their relations to other fossil hominids. Material evidence of culture associated with fossil man.

637. Living Races of Man. Four credit hours. Spring Quarter. General prerequisites must include an introduction to physical anthropology and fifteen hours of biology including one course in genetics. Mr. Estel.

A generalized approach of the racial classification of man on a biological basis. The formation of races, racial ancestry, and the distribution of human physical types. Biological race differences and race mixture.

639. Theory and Problems of Cultural Anthropology. Four credit hours. Winter Quarter. General prerequisites must include twenty hours in allied subjects. Mr. Bennett.

A survey of the development and present status of the major theoretical viewpoints in cultural anthropology; major contributions to knowledge—for example, the concept of culture; "applied anthropology" and its accomplishments; and the relations of cultural anthropology to psychology and other social sciences.

670. Principles of Research in Archaeology. Four credit hours. Spring Quarter. Lectures, museum study, field trips. General prerequisites must include ten hours of anthropology and ten hours of work closely related to archaeological field research; and consent of instructor. Mr. Estel, Mr. Baby.

Instruction in basic methods of archaeological analysis, including artifact typology and cultural classification. Methods of excavation and recording of specimens and features will be taught on one-day or weekend field sessions on archaeological sites in the Columbus area.

674. Archaeological Training Expedition. Eight credit hours. Full time in expedition camps. General prerequisites must include course in anthropology and archaeology. Mr. Estel, Mr. Baby.

Qualified students registering for this course will join the joint expedition of the Ohio State University and the Ohio State Museum, which will be engaged in excavating prehistoric sites in Ohio. Instruction and experience will be provided in every phase of archaeological field work.

* Not given in 1954-1955.

*710. Introduction to Anthropological Research. Three credit hours. Autumn Quarter. General prerequisites must include fifteen hours of anthropology or ten hours of closely related work, and consent of the instructor. Mr. Bennett, Mrs. Bourguignon.

Nature and scope of research problems in anthropology. Relation of problems in contemporary and past theoretical schools in anthropology. Survey of methods in field ethnology, theoretical cultural anthropology, archaeology and physical anthropology.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

820. Seminar in Anthropology. Three credit hours. Autumn, Winter, and Spring Quarters. Mr. Bennett, Mrs. Bourguignon, Mr. Estel.

SOILS

(See Agronomy)

SPANISH

(See Romance Languages and Literatures)

SPECIAL EDUCATION

(See Bureau of Special and Adult Education)

SPEECH

Office, 205 Derby Hall

PROFESSORS YEAGER, WILEY, HARDING, SUMMERS, KNOWER, SANDERSON, MOSER, BLACK, AND McDOWELL, ASSOCIATE PROFESSORS EMSLEY, SCHRECK, UTERBACK, McGAW, AND CARMACK, ASSISTANT PROFESSORS RILEY, EWING, IRWIN, O'NEILL, FOTHERINGHAM, ANDERSON, AND MALL, MR. HOAK

Prerequisites for Graduate Study: A graduate student is expected to have completed a minimum of forty Quarter credit hours in speech and related fields, of which at least twenty-five hours shall be in speech, before he may be accepted as a prospective candidate for a degree in speech. Exceptions may be made in the case of students whose undergraduate work has been of outstanding quality or who have had extensive practical experience in the area of the Department in which specialized study is to be undertaken. All other students must make up any deficiency by taking such extra or compensatory work as the Chairman of the Department and advisers may deem necessary. The student must be able to write and speak with reasonable clarity and good usage, and his ability to meet these requirements may be tested by written and oral qualifying examinations.

Program of study for the M.A. and the Ph.D. Degrees: The following areas are recognized by the Department for purposes of study and examinations:

1. Rhetoric, Public Address and Discussion.
2. History and Theories of the Theatre and Play Production.
3. Radio and Television Programming.
4. Speech Science.
5. General Speech Education.
6. Related Areas in Other University Departments.

The M.A. Degree: A graduate student seeking a Master's degree in speech shall complete the following requirements:

1. Speech 705. Areas and Techniques of Research in Speech.
2. A program of study in at least two of the areas listed above, one to be selected as the area of specialization.
3. A satisfactory thesis. A Master's thesis in theatre may include production of a play. A written record of research and technical work incident to the production shall be included in the thesis.

The Ph.D. Degree: A graduate student seeking a Doctor's degree in speech shall select (with the approval of the Graduate Committee of the Department) and carry out one of the following programs:

1. For the *general degree in speech* the program of study and research includes
 - a. A specialized study of one area in the Department,

* Not given in 1954-1955.

- b. A general study of two or more additional areas, at least one of which shall be a related area in another Department,
 - c. A minimum of four graduate courses, each a Quarter in length, in the Department outside the areas of special or general study,
 - d. A satisfactory dissertation; or
2. For the *special degree in speech* the program of study and research includes
- a. A specialized study limited to any one of the three areas of speech: History and Theories of the Theatre and Play Production; Radio and Television Programming; Speech Science.
 - b. A general study of an additional area, which shall be a related area in another Department,
 - c. A satisfactory dissertation.

First Registration: A prospective student in speech who is registering in the Graduate School for the first time should confer as soon as possible with the Chairman of the Department of Speech, who will refer him to the appropriate members of the staff for consultation and advice on study programs. The student should bring a transcript of his record to these conferences.

Department Committee on Graduate Study: All general requirements which are in addition to those of the Graduate School are administered by the Graduate Committee of the Department of Speech. The supervision of most of these requirements, particularly those for specialization, will rest with the student's advisory committee.

SPEECH COURSES IN OTHER DEPARTMENTS

For Psychology 682 (Psychology of Speech), Psychology 633 (Psychology of the Audience), and Psychology 704 (Tests and Measurements in Speech Education) see the offerings of the Department of Psychology. For Education 600-U (Minor Problems in Speech Education), Education 675 (The Teaching of Speech in the Secondary School), and Education 800-U (Seminar in Speech Education) see the offerings of the Department of Education. For Physics 645 (Acoustics for Students of Music and Speech) see the offerings of the Department of Physics and Astronomy.

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

601. The Forms of Public Address. Five credit hours. Autumn Quarter.
Mr. Yeager.

A study of special methods by which speech is made clear, interesting, and forceful. Practice in using these methods in the preparation and delivery of the different forms of public address, including nominating, dedicatory, eulogistic, after dinner, and general academic, political, and business speeches. A broad view of language training is given with the object of increasing the student's command of thought in writing and talking as well as in public speaking.

603. Group Thinking and Conference Leadership. Five credit hours. Winter Quarter. **Mr. Utterback.**

The procedures used in exchanging information, solving problems, determining policies, and resolving differences in committees and other small groups. The methods of leading discussions and conferences.

***610. Advanced Argumentation and Debate.** Five credit hours. Spring Quarter. Two practice periods and special meetings each week. General prerequisites must include a course in Argumentation. **Mr. Carmack.**

Study of advanced principles of argumentation used in deliberative and forensic debating. Critical analysis and evaluation of debating as a means of democratic action. Study of the logical and ethical appeals and standards used in debate.

To be offered in 1955-1956.

***617. Problems of American Phonetics.** Three credit hours. Spring Quarter. **Mr. Emsley.**

The chief problems treated are: phonetic alphabets and dictionaries, research in dialect, and phonemic analysis.

To be offered in 1955-1956.

620. Ancient Rhetorical Theory. Three credit hours. Autumn Quarter. General prerequisites must include Speech 601. **Mr. Wiley.**

A study of the rhetorical theories of Plato, Aristotle, Cicero, Quintilian, and other important classical writers.

Not offered in 1955-1956.

* Not given in 1954-1955.

***621. English Rhetorical Theory.** Three credit hours. Winter Quarter. General prerequisites must include Speech 620. Mr. Harding.

A study of the theories of leading British rhetorical writers from Thomas Wilson to Archbishop Whately.

To be offered in 1955-1956.

623. British Speakers and Speech Making. Three credit hours. Spring Quarter. General prerequisites must include Speech 621. Mr. Harding.

Study and comparison of the careers of representative British orators from the Renaissance to the present. Analysis and criticism of their leading speeches and debates.

Not offered in 1955-1956.

***624. American Speakers and Speech Making.** Three credit hours. Spring Quarter. General prerequisites must include Speech 621. Mr. Harding.

Study and comparison of the careers of representative American orators from Colonial times to the present. Analysis and criticism of their leading speeches and debates.

To be offered in 1955-1956.

***626. Advanced Acting.** Three credit hours. Autumn Quarter. General prerequisites must include fundamental courses in acting and permission of the instructor. Mr. McGaw.

Advanced work in the principles of acting, its techniques and stage practices with emphasis upon the historical development for application to period productions and adaptation to modern stylistic treatment. Research into the history of acting theory and acting practice in important periods in the theatre. Individual and group laboratory assignments of acting roles from representative plays.

To be offered in 1955-1956.

627. Advanced Stagecraft and Design. Five credit hours. Winter Quarter. Two lectures and three two-hour laboratory periods each week. General prerequisites must include a course in elementary stagecraft and Speech 633. A basic course in drawing is recommended. Mr. Hoak.

Advanced training in specialized aspects of stagecraft and design. Styles in design and methods of building stage sets are considered in connection with production. Painting techniques are studied in relation to surfaces and effects. Special types of scenery are designed, built, and rigged. Training is given to shop management and budget planning.

Not offered in 1955-1956.

***629. Stage Lighting.** Three credit hours. Spring Quarter. One hour lecture and two two-hour laboratory periods each week. General prerequisites must include a course in elementary stagecraft, a course in play production, Speech 627 and 632. A beginning course in physics is recommended. Mr. Hoak.

Principles and practices in stage lighting. Technical instruction is given in the elements of electricity, the care and function of instruments, types and styles of lighting, composition, color and special effects.

To be offered in 1955-1956.

631-632-633. History of the Theatre. Three credit hours each Quarter. Autumn, Winter, Spring. General prerequisites must include a course in Shakespeare, and English 670 is recommended. Mr. McDowell.

A general survey of the rise and development of the theatre: the Classical, Medieval, Renaissance, Commedia dell'arte, later English and Continental, and Modern Theatre. Particular reference will be given to the origin of theatrical forms, and to staging in relation to the forms along with the reading of selected plays, reports, and round-table discussions. Illustrations of stage and scenery will accompany each lecture.

***641. History of Stage Costume.** Five credit hours. Autumn Quarter. General prerequisites must include a course in play production or equivalent; prerequisite or concurrent, Speech 631. Courses in Art History recommended. Mr. McGaw.

An intensive and detailed study of historical, national, and traditional costumes from the early Egyptian period through the Nineteenth Century. Lectures, slides, and demonstrations.

To be offered in 1955-1956.

* Not given in 1954-1955.

646. Stage Direction. Five credit hours. Winter Quarter. Two hours lecture and three two-hour laboratory periods each week. General prerequisites must include a course in play production or equivalent. Mr. Schreck, Mr. McGaw.

An intensive study and practice of the methods and techniques of the director. Principles and practice in composition, picturization, movement, pantomimic detail, rhythm. An analysis of types and styles of scripts from the viewpoint of the director. Each student will direct a one-act play.

648. Playwriting. Five credit hours. Autumn Quarter. General prerequisites must include one of the following courses: English 676, 677, or 670. Mr. Shedd.

Elementary laboratory course in playwriting. Methods of play analysis with attention to dramatic technique. An historical consideration of the major forms of drama.

Not offered in 1955-1956.

***651. Modern Theatre Styles.** Three credit hours. Spring Quarter. General prerequisites must include Speech 646; prerequisite or concurrent, Speech 633; English 670 is recommended.

A study of the realistic and non-realistic styles in modern theatrical production. Detailed consideration of naturalism, realism, symbolism, expressionism, and theatricalism. The validity of these approaches in relation to the aesthetics of the theatre.

To be offered in 1955-1956.

652. Broadcast Programs and Audiences. Three credit hours. One Quarter. Autumn, Winter, Spring. Mr. Summers.

Broadcasting as a social force and as an agency of mass communication. Program types, basic program structure, elements of program effectiveness. Audience characteristics and listener preferences in relation to programs.

654. Radio Writing. Three credit hours. One Quarter. Winter and Spring. General prerequisites must include Speech 652 and credit in at least two courses in composition in either English or Journalism. Mr. Mall.

Practice in the planning and writing of continuities of types of radio programs used on local stations, including musical, variety, and special events programs.

662. Radio and Television Drama. Three credit hours. One Quarter. Autumn and Spring. General prerequisites must include Speech 652 and credit in at least two courses in composition either in English or Journalism. Mr. Riley.

History of drama in radio and television programming; use of dramatic forms in propaganda, education and entertainment. Analysis of major dramatic program types and program elements including settings, characterization and plot structure. Extensive reading and study of radio and television dramatic scripts, and supervised practice in the writing of original scripts for broadcast.

666. Advanced Radio Production-Directing. Three credit hours. Winter Quarter. General prerequisites must include a basic course in radio program production. Mr. Riley.

Advanced training in the production and directing of radio programs, with major attention to forms in general use on local radio stations. Experience in use of studio and control room equipment.

670. Radio and Television Program Planning. Two credit hours. Winter Quarter. General prerequisites must include at least ten hours credit in courses in radio in the Speech Department, including Speech 652. Mr. Summers.

Preparation of station program schedules; planning and organization of various types of local programs within limitations of program budgets. Development of new programs through the planning stage, and consideration of changes in existing programs for increased listener interest.

672. Television Programs. Three credit hours. Autumn Quarter. General prerequisites must include Speech 652. Mr. Summers.

* Not given in 1954-1955.

Analysis of basic program forms used on television; requirements of effective program structure; consideration of the audience situation in relation to programs. Lectures and extensive observation.

677. Anatomy, Physiology, and Pathology of the Ear and Vocal Mechanisms. Five credit hours. Winter Quarter. Mr. Alpert.

Lectures, readings, discussions, demonstrations and laboratory dissections presenting the structure, functions and diseases of the ear and vocal mechanisms and associated structures.

678. Hearing and Speech. Three credit hours. Winter Quarter. General prerequisites must include Physics 645 and Speech 682 or equivalent. Mr. O'Neill.

Basic concepts of psychophysics and psychophysiology of hearing with particular reference to the reception of speech.

682. Hearing Conservation and Pathology. Three credit hours. Autumn Quarter. General prerequisites must include ten hours in speech or psychology. Mr. Anderson.

Introduces the student to the area of hearing therapy. A consideration of hearing deficiencies and their effect on social, personal, and school adjustment. Special attention to cooperation between therapist and physician in promoting hearing conservation. Information on prevalence, causes, types, and effects of hearing impairments.

683. Lip Reading. Three credit hours. Winter Quarter. Five recitations each week. General prerequisites must include Speech 682. Mr. Anderson.

The visual-speech-reading problems of those with sufficient residual hearing to justify continuance in the public schools rather than reference to schools for the deaf. Foundation procedures and fundamental exercises. Practice with hard-of-hearing persons under direct supervision.

684. Lip Reading Clinic. Three credit hours. Spring Quarter. Five meetings each week. General prerequisites must include Speech 683. Mr. Anderson, Mr. O'Neill.

Clinical application of principles learned in Speech 683.

688. Audiometry: Principles and Practices. Three credit hours. Spring Quarter. General prerequisites must include Speech 682. Five hours in class and a laboratory period each week. Mr. O'Neill, Mr. Anderson.

Study of functional tests of hearing, including individual and group screening and threshold tests. Special tests of hearing, loudness balance, recruitment, tolerance, speech reception, psychogenic deafness and malingering. Supervised practice in administration and interpretation of audiometric tests.

***690. The Pre-School Deaf Child.** Three credit hours. Winter Quarter. Mr. Anderson.

Study of problems peculiar to the pre-school deaf child.

To be offered in 1955-1956.

694. Speech Disorders Survey. Three credit hours. Autumn Quarter. Mr. Moser.

Introduction to the area of disorders of speech. Primary attention is given to the more common speech deviations. Students observe examinations and corrective methods of clinicians in the speech clinic.

695. Speech Pathology I. Three credit hours. Winter Quarter. Lectures, demonstrations, observations. General prerequisites must include Speech 694. Mr. Moser.

A continuance of Speech 694 with special consideration of severe voice deviation and articulation disorders, such as cleft palate, cerebral palsy, paralysis, and maxillo-facial injuries.

696. Speech Pathology II. Three credit hours. Spring Quarter. General prerequisites must include Speech 694 and ten hours of Psychology. Mr. Moser.

Continuation of Speech 694 with emphasis on psychological aspects of speech disorders, including stuttering, speech retardation, psychogenetic dysphonias, and psychological assessment of speech defectives. Observation of cases in the Speech and Hearing Clinic.

* Not given in 1954-1955.

697. Clinical Principles in Speech Correction. Three credit hours. Autumn Quarter. Five meetings each week. Speech 694 must be included in the general prerequisites or taken concurrently. Mrs. Irwin.

Emphasis on the examination, diagnosis and correction of speech disorders. Observation and explanation of clinical procedures.

698. Clinical Practice in Speech Correction. Two or three credit hours. Autumn Quarter. Five meetings each week. General prerequisites must include Speech 695 and 697. Mrs. Irwin.

Clinical practice in Speech Correction. The student will be given opportunity to study and work with a wide range of speech cases in the University Clinic, the Orientation Week Health Line, etc. To make arrangements, he should, therefore, if possible, communicate with the department well before the opening of the Quarter.

This course may be repeated one time.

700. Minor Problems in Speech. One to five credit hours. All Quarters. Conference, library, and laboratory work. General prerequisites must include permission of the instructor and the chairman of the department. This course may be repeated for a total of fifteen credit hours. Departmental staff.

705. Areas and Techniques of Research in Speech. Three credit hours. Autumn Quarter. General prerequisites must include twenty-five hours in speech. Mr. Knower.

Explanation of the principal areas of graduate research in speech with a review and critical commentary on typical methods of research done in each. Discussion of possible future investigations and of the techniques and standards of research used in the several areas. Library, Clinic, and Laboratory facilities. Preparation of bibliographies and research reports.

710. Contemporary Speeches. Three credit hours. Winter Quarter. Mr. Harding.

Analysis and criticism of the speeches of leading American men of public affairs, preachers, and educators, particularly those delivered since World War II.

***735. Theatrical Criticism.** Five credit hours. Spring Quarter. General prerequisites must include one of the following: English 676, 677, 670. Mr. McDowell.

A survey of critical theories from the Greek to the modern period with particular reference to the influence of the theorists, the church, the state and the press in the development of the theatre. Illustrated lectures will establish the connection between critical opinion and stage practice. Attention will be given to an analysis of dramatic forms and conventions, a study of current newspaper and magazine criticisms with practice in writing reviews, and a consideration of the stage and the movies as art forms.

Not open to students who have credit for Speech 635.

To be offered in 1955-1956.

740. Theatre Organization and Management. Three credit hours. Winter Quarter. Three class hours and three laboratory hours each week. Mr. Schreck.

A general analysis of school, college, church, and community theatres and the organization and management of each type. An intensive study of a selected type of theatre by each student.

Not offered in 1955-1956.

***743. Children's Theatre.** Three credit hours. Winter Quarter. General prerequisites must include Speech 646 or an equivalent. Three class hours and three laboratory hours each week. Mr. Schreck.

Directing and producing plays for children. Improvisations of short scenes. Judging and editing the text. Each student will direct a short play.

Not open to students who have credit for Speech 643.

To be offered in 1955-1956.

745. Advanced Theatre Direction and Production. Five credit hours. Spring Quarter. General prerequisites must include Speech 651, 646, and either Speech 627 or 629. English 670 is recommended.

Advanced theory and practice of play direction in the modern theatre. Technique of casting.

* Not given in 1954-1955.

conducting rehearsals, and integrating the elements of production. Class members, under supervision of the instructor, will produce a modern or an historical play for public presentation. Laboratory hours in addition to scheduled meetings.

Not offered in 1955-1956.

760. Radio and Television Program Policies. Two credit hours. Spring Quarter. Mr. Summers.

Programming problems and policies of networks and individual stations; basic policies in the handling of political, religious, public affairs and children's programs and of discussion of controversial issues. Influence of public attitudes and of decision of regulatory bodies on basic program standards.

764. Writing for Television. Three credit hours. Autumn Quarter. General prerequisites must include Speech 672 and either Speech 654 or Speech 662. Mr. Mall.

Analysis of television script requirements in comparison with those for radio programs. Supervised practice in the writing of television programs.

Not open to students who have credit for Speech 663.

765. Television Production and Directing. Three credit hours. Winter Quarter. General prerequisites must include Speech 672 and Speech 666 or the equivalent, and permission of the instructor. Mr. Mall.

Basic training in the production and directing of television programs; planning of sets, plotting of shows, use of studio equipment, and the supervision of programs through the rehearsal stage.

766. Advanced Television Production and Directing. Three credit hours. Spring Quarter. General prerequisites must include Speech 765 and permission of the instructor. Mr. Mall.

Continuation of Speech 765, with emphasis on problems of television program building and on directing television programs.

778. Experimental Phonetics. Three or five credit hours. Spring Quarter. Two one-hour lecture periods and three two-hour laboratory periods each week. Speech 617 and 678 must be included in the general prerequisites. Mr. Black.

Laboratory investigations of problems of phonetics as they are related to functional speech.

†781. Curricular and Instructional Adjustment for the Deaf Child. Three credit hours. Offered in Summer Quarter only. General prerequisites must include Speech 690. Mr. Anderson.

Adaptation of nursery school, kindergarten and elementary methods; planned development of language; silent reading; lip reading; outline of work for each Quarter.

785. Advanced Clinical Practice in Speech Correction, Lip Reading, or Instruction of the Deaf. One to fifteen credit hours. Winter Quarter. Three hours per week will be devoted to clinical practice for each credit hour. General prerequisites or concurrent: (1) for Speech Correction, Speech 696 and 698; (2) for Lip Reading, Speech 678 and 684; (3) for Instruction of the Deaf, Speech 781. Permission of the Director of the Speech and Hearing Clinics is required. Mr. Moser and Senior Staff.

Clinical experience in examination, diagnosis and therapy with opportunity for field experience such as may be indicated by the student's training and desire for future professional employment or practice.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

820. Seminar in Public Address. Three to five credit hours. Autumn, and Winter Quarters. This course may be repeated for credit. Topic to be chosen from the following:

- (a) Rhetorical Theory
- (b) Speech Criticism
- (c) Group Thinking and Conference Leadership
- (d) Argumentation and Debate

† Not given during the academic year, 1954-1955.

840. Seminar in Theatre. Three to five credit hours. Autumn, Winter, and Spring Quarters. This course may be repeated for credit. Topic to be chosen from the following:

- (a) Eighteenth-Century Pantomime. Autumn Quarter, 1953.
- (b) The Commedia dell'arte. Winter Quarter, 1954.
- (c) History of American Theatre. Spring Quarter, 1954.
- (d) Nineteenth-Century Stage Design. Autumn Quarter, 1954.
- (e) The Renaissance Stage. Winter Quarter, 1955.
- (f) Advanced Problems in Acting. Spring Quarter, 1955.

860. Seminar in Radio and Television Programming. Three to five credit hours. Autumn, Winter, and Spring Quarters. This course may be repeated for credit. Mr. Summers.

877. Speech Pathology. Two credit hours. Winter Quarter. General prerequisites must include Speech 698 and courses in allied fields satisfactory to the instructor. Mr. O'Neill and Medical Staff.

The serious and major speech impairments, traceable specifically to disease, mental inhibition, neuroses, psychoses, physiological mal-development or impeding growths, traumatic interference, etc. Stuttering, aphasia, aphonia, cleft-palate speech, disturbances traceable to mental retardation, auditory asthenia of varying kinds, spastic speech, etc. Types, degrees, causes, and consequences. Techniques of speech training involved.

880. Seminar in Phonetics, Speech Correction, Speech Pathology, Hearing. One to five credit hours. Autumn, Winter, and Spring Quarters. This course may be repeated for credit. Mr. Black and senior staff.

Topic to be chosen from the following:

- (a) The Application of Psychological Techniques and Information Theory to Intelligibility, Side-tone, and other Aspects of Experimental Phonetics. Autumn, 1953; Winter, 1954.
- (b) Special Procedures of Speech and Hearing Therapy. Spring, 1956.
- (c) The Speech Manifestation of Facial, Maxillary, and Pharyngeal Disturbances. Winter, 1954; Spring, 1954.
- (d) Quantitative Studies of the Process of Hearing. Autumn, 1953.
- (e) Verbal and Phonetic Anomalies of Retarded Speech. Spring, 1954; Autumn, 1954.
- (f) An Analytical Study of Special Screening, Diagnostic, and Threshold Tests of Hearing. Winter, 1954.
- (g) Design of Experiments with Particular Reference to Side-tone, Intelligibility, and Voice Variables. Autumn, 1954; Winter, 1955.
- (h) Behavioral Patterns Associated with Defective Hearing, Diagnosis and Treatment, Including Hearing Aids and Auditory Training. Autumn, 1955; Winter, 1956.
- (i) Psychogenic Speech Disturbances, Including Stuttering. Spring, 1955.
- (j) Language and Acoustic Patterns of Deafness. Summer, 1953-1954.
- (k) Speech Accompaniment of Disorders of the Central Nervous Systems. Winter, 1955; Spring, 1955.
- (l) Comparative Phonetics and Dialect.

881. Seminar in the Nature of Oral Language. One to four credit hours. Winter Quarter. Mr. Knower, Mr. Black.

A consideration of spoken words as an evidence of man's early efforts to store and communicate meanings. Analysis on the basis of word-symbols, word concepts, and real words. The relation of word-concepts to the actuality which they reflect. Possible applications to speech problems of the various relationships between words and consciousness.

899. Interdepartmental Seminar. One to five credit hours. All Quarters.

When two or more departments desire to establish an interdepartmental seminar on a subject of common interest, the chairman or authorized representatives of the departments concerned shall prepare a course description including the names of the faculty members designated to conduct the seminar. The statement shall be submitted to the Executive Committee of the Graduate School for prior approval.

950. Research in Speech. Autumn, Winter, and Spring Quarters. Library, conference, and laboratory work. General prerequisites must include acceptable courses in the chosen field of research. The student may spend a part or all of his time on research work.

Research in speech under the direction of those members of the staff in whose field the student's specialization lies.

SURGERY

Office, University Hospital

PROFESSORS ZOLLINGER AND JACOBY, ASSOCIATE PROFESSOR JAMES

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," see page 51.

780. Minor Problems. One to five credit hours. All Quarters. Library, conference, clinic and laboratory work. General prerequisites must include adequate preclinical training and permission of instructor. Mr. Zollinger and staff.

FOR GRADUATES

900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

900. Seminar. Three to five hours. Autumn, Winter, and Spring Quarters. Students are responsible for the material presented at these seminars at least twice a year. Attendance at weekly Grand Rounds on the surgical service, as well as weekly attendance of X-ray and surgical pathological conferences is required. Staff.

950. Research in Surgery. All Quarters. Library, conference, clinical and laboratory work. General prerequisites include an acceptable surgical background and proof of interest in and ability to undertake investigative work. Permission of instructor and registration of the Graduate School are required. An opportunity is offered for investigation of problems in general surgery, thoracic surgery, orthopedics, urology, and anesthesia. Mr. Zollinger, Mr. James, Mr. Jacoby, Mr. Klassen, Mr. Clatworthy, and Mr. Ellison.

SURVEY COURSES**FOR ADVANCED UNDERGRADUATES AND GRADUATES**

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

ARTS SURVEY

605. Foundations of Contemporary Civilization. Five credit hours. One Quarter. Autumn, Winter, Spring. Five meetings each week. Mr. Evans, Mr. Chandler, Mr. Hartman.

A study of the major movements of thought in science, social philosophy, the humanities, and religion in the development of Western civilization.

608. Development of Modern Science. Five credit hours. One Quarter. Autumn, Winter, Spring. Five meetings each week. Mr. Spieker, Mr. Fuller.

The purpose of this course is to give the student a general view of the historical development of scientific ideas, and to dwell upon the nature and validity of scientific hypotheses and theories from a scientific point of view.

VETERINARY ANATOMY

Office, 204 Veterinary Laboratory

PROFESSOR GROSSMAN

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

701. Minor Problems. Two to five credit hours. Autumn, Winter, and

Spring Quarters. Laboratory work, three hours for each credit hour. General prerequisites must include Veterinary Anatomy 611 and permission of the instructor. Mr. Grossman.

This course offers advanced training and instruction in Veterinary Anatomy. The work is carried out as laboratory investigation of special problems.

751. Gross and Histologic Technics. Two to five credit hours. Autumn, Winter, and Spring Quarters. General prerequisites must include Veterinary Anatomy 616, 617 and 618, or equivalent and permission of the instructor. Mr. Grossman.

Consists of instruction in the technic for the preparation of specimens for dissection. It also covers the handling of tissue from such prepared specimens as well as the preparation of tissues from unembalmed animals in the making of histological slides. It deals with the examination of tissue with the aid of a microscope. The important methods in the preparatory steps required in collecting specimens, fixation, embedding, staining and mounting are considered.

Not open to students who have credit for Veterinary Anatomy 504 or 701B.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

950. Research in Veterinary Anatomy. Autumn, Winter, and Spring Quarters. Library, conferences and laboratory. Mr. Grossman.

VETERINARY CLINICS

Office, 115 Veterinary Clinic Building

DEAN, WALTER R. KRILL; DIRECTOR, VERNON L. THARP;
ASSISTANT DIRECTOR, EARL J. CATCOTT

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

701. Minor Problems. Three to ten credit hours. Autumn, Winter, and Spring Quarters. General prerequisites must include senior standing in the College of Veterinary Medicine and permission of the instructor. This course is given under the supervision of any department associated with the Clinic.

FOR GRADUATES

800 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

810. Advanced Clinical Technique. Three to ten credit hours. Autumn, Winter, and Spring Quarters. Permission of the Director of Clinics and instructor in charge is required.

VETERINARY MEDICINE

Office, 8 Veterinary Laboratory

ASSOCIATE PROFESSOR VENZKE, ASSISTANT PROFESSOR CATCOTT

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

701. Minor Problems. Two to eight credit hours. Autumn, Winter, and Spring Quarters. Library, conferences and laboratory. General prerequisites must include adequate clinical training, satisfactory scholarship, and permission of the instructor. Mr. Venzke, Mr. Catcott.

750. Ophthalmology. Three credit hours. Autumn, Winter, and Spring Quarters. General prerequisites must include Veterinary Physiology and Pharmacology 610 and 611; Veterinary Medicine 620, 732 or equivalent, and permission of the instructor. Mr. Catcott.

A study of the eye in animals with special emphasis upon the external diseases, the diagnosis of internal disease, and the relation of this organ to general disease. The course is supplemented by clinical case work.

755. Clinical Endocrinology. Three to five credit hours. Autumn, Winter, and Spring Quarters. General prerequisites must include Veterinary Physiology and Pharmacology 610, 611; Veterinary Medicine 620, 738 or equivalent, and permission of the instructor. Mr. Venzke.

A study of the clinical manifestations and diagnosis of dysfunction of the endocrine glands. Special consideration is given to the correlation of the endocrine control of metabolism, supplemented by clinical case work.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

950. Research in Veterinary Medicine. Autumn, Winter, and Spring Quarters. Library, conferences, and laboratory. General prerequisites must include acceptable courses in the selected field of research and the ability to undertake the selected problem. Mr. Venzke, Mr. Catcott.

VETERINARY PARASITOLOGY

Office, 4 Veterinary Laboratory

PROFESSOR REBRASSIER, ASSOCIATE PROFESSOR KOUTZ

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

623. Advanced Veterinary Parasitology. Two to five credit hours. Autumn, Winter, and Spring Quarters. General prerequisites must include Veterinary Parasitology 621 and 622, or equivalent, and permission of the instructor. Conference, laboratory and museum. It may be repeated for a total of fifteen credit hours. Mr. Rebrassier, Mr. Koutz.

This course includes a review of literature, detailed study of classification, morphology, life histories and economic importance.

701. Minor Problems. Two to eight credit hours. Autumn, Winter, and Spring Quarter. General prerequisites must include Veterinary Parasitology 621, 622; Veterinary Clinics 733, or equivalent, and permission of the instructor. This course may be repeated for a total of fifteen credit hours. Mr. Rebrassier, Mr. Koutz.

Not open to students who have credit for Veterinary Parasitology 826.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

827-828-829. Seminar in Veterinary Parasitology. One credit hour each. Autumn, Winter, and Spring Quarters. Department staff.

950. Research in Veterinary Parasitology. Autumn, Winter, and Spring Quarters. General prerequisites must include acceptable courses in the chosen field of research. Mr. Rebrassier, Mr. Koutz.

VETERINARY PATHOLOGY

Office, 130 Veterinary Clinic

ASSOCIATE PROFESSOR COLE

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

610. Pathology Technic. Two to five credit hours. Autumn, Winter, and Spring Quarters. Prerequisite, Veterinary Pathology 621, or equivalent, and permission of the instructor. Mr. Cole.

Practice in collecting, fixation, embedding, sectioning, and staining of animal tissue. The application of histochemical methods to pathology.

701. Minor Problems. One to ten credit hours. Autumn, Winter, and Spring Quarters. A student may enter at the beginning of any Quarter. General prerequisites must include Veterinary Pathology 621 or equivalent, and permission of the instructor. Mr. Cole.

Not open to students who have credit for Veterinary Pathology 801B and 801C.

776. Advanced Systematic Pathology. Two to ten credit hours. Autumn, Winter, and Spring Quarters. Demonstrations, laboratory and museum work. General prerequisites must include Veterinary Pathology 621, 622, 701 or equivalent, and permission of the instructor. Mr. Cole.

An advanced study of diseases as they affect the various systems of the animal body. Neuropathology is emphasized. Abundant fresh and preserved organs, as well as clinical and pathological records which are on file, provide unlimited material for study. Advanced clinical pathological and experimental technics are studied.

Not open to students who have credit for Veterinary Pathology 615.

778. Veterinary Surgical Pathology. Two to ten credit hours. Spring Quarter. Demonstrations, laboratory and library. General prerequisites must include Veterinary Surgery 623, Veterinary Pathology 622, or equivalent, and permission of the instructor. Mr. Cole.

Bopsy methods and diagnosis. Surgical specimens are studied and emphasis is placed upon the correlation of lesions and associated functional alterations.

Not open to students who have credit for Veterinary Pathology 801a.

786. Animal Oncology. Two to ten credit hours. Autumn Quarter. Laboratory, library and conference. General prerequisites must include Veterinary Pathology 621 or equivalent, and permission of the instructor. Mr. Cole.

A study of neoplasms occurring in animals. This course includes transplantation, experimental production, and identification of neoplasms as well as their effects on the host.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

807-808-809. Seminar in Veterinary Pathology. One credit hour. Autumn, Winter, and Spring Quarters.

950. Research in Veterinary Pathology. Autumn, Winter, and Spring Quarters. General prerequisites must include acceptable courses in the chosen field of research. Mr. Cole.

VETERINARY PHYSIOLOGY AND PHARMACOLOGY

Office, 202 Veterinary Laboratory

PROFESSOR KINGMA

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

701. Minor Problems. Three to fifteen credit hours. Autumn, Winter, and Spring Quarters. Designed for qualified students who wish to begin research in Veterinary Physiology. General prerequisites must include permission of the instructor. Mr. Kingma.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

950. Research in Veterinary Physiology and Pharmacology. Mr. Kingma.

VETERINARY PREVENTIVE MEDICINE

Office, 8 Veterinary Laboratory

PROFESSOR HELWIG

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

701. Minor Problems. Two to five credit hours. Autumn, Winter, and Spring Quarters. General prerequisites must include Veterinary Preventive Medicine 620, and permission of the instructor. A student may enter at the beginning of any Quarter. Mr. Helwig.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

800. Seminar in Veterinary Preventive Medicine. One credit hour. Autumn, Winter, and Spring Quarters. Required of all graduate students. Department staff.

810. Veterinary Public Health. Three to eight credit hours. Autumn, Winter, and Spring Quarters. General prerequisites must include Veterinary Preventive Medicine 740. Mr. Helwig.

A study of the problems involved in public health as it pertains to transmission of disease from animal to man. Also means of improving methods of food hygiene.

950. Research in Veterinary Preventive Medicine. Autumn, Winter, and Spring Quarters. General prerequisites must include acceptable courses in the chosen field of research.

VETERINARY RESEARCH

Office, Ohio Agricultural Experiment Station, Wooster, Ohio

PROFESSORS EDGINGTON, REBRASSIER, KRILL, HELWIG, AND KINGMA,
ASSOCIATE PROFESSORS COLE, FERGUSON, KOUTZ, AND VENZKE

The departmental laboratories wherein the major portion of the active work is conducted are located at Wooster, Ohio. Here well-equipped laboratories and facilities for housing and isolation of experimental animals, including poultry, are available. These laboratories represent a focal point for the animal disease investigations of the College of Veterinary Medicine, Ohio Agricultural Experiment Station, and the Division of Animal Industry, the Ohio Department of Agriculture.

The work of the department is of interest primarily to advanced undergraduates and graduate students, but information regarding various projects under study is available to other courses presented by the College.

The facilities of the department provide ample opportunities for the interested and able veterinary student to pursue a variety of studies under the direction of the staff.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

950. Veterinary Research.

VETERINARY SURGERY

Office, 100 Veterinary Clinic

PROFESSOR GUARD, ASSISTANT PROFESSORS JOHNSON AND RUDY

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

701. Minor Problems. One to five credit hours. Autumn, Winter, and Spring Quarters. General prerequisites must include Senior standing and permission of the instructor. Mr. Guard, Mr. Johnson, Mr. Rudy.

Advanced work in surgery and sterility.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

950. Research in Veterinary Surgery. Mr. Guard.

VOCATIONAL EDUCATION

(See Education)

WELDING ENGINEERING

Office, 128 Industrial Engineering Building

PROFESSOR GREEN, ASSISTANT PROFESSOR SPIELBERG, MR. McCAULEY

FOR ADVANCED UNDERGRADUATES AND GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

646. Welding Science and Its Applications. Three credit hours. Spring Quarter. Three lectures or recitations and six hours of preparation each week. General prerequisites must include Mechanics 602.

A basic study of welding and its applications.

†701. Physics of Welding. Four credit hours. Autumn Quarter. Three lectures or recitations and one three-hour laboratory period each week. General prerequisites must include Mechanical Engineering 601 and Mechanics 605. The application of basic physical principles in the welding processes.

Safety glasses must be worn in the laboratory. See footnote.

†702. Principles of Resistance Welding. Four credit hours. Winter Quarter. Three lectures or recitations and one three-hour laboratory period each week. General prerequisites must include Electrical Engineering 644 and Mathematics 608.

† Courses Industrial Engineering 404, 405, 419, 420, 421, and Welding Engineering 415, 416, 701, 702, 703, 739, 741, and 742 require the use of a pair of safety glasses; however, each student need own only one pair for all courses. In the event that the student must have prescription lenses, he shall obtain his safety glasses during the Quarter preceding their first use. This may be done through the Optometry Clinic, Room 15, Optometry Building, or through any registered optometrist.

Theory and operation of equipment. Recommended practices, codes, standards, and applications. Installation, maintenance, and instrumentation.

Safety glasses must be worn in laboratory. See footnote.

†703. Non-Destructive Testing. Four credit hours. Spring Quarter. Three lectures or recitations and one three-hour laboratory period each week. General prerequisites must include Electrical Engineering 644 and Mathematics 608.

Theory and application of X-ray equipment and magnetic particle inspection equipment to the quality control of weldments and other metal fabrications. Special non-destructive methods of testing.

Safety glasses must be worn in laboratory. See footnote.

†739. Principles of Welding. Four credit hours. Autumn Quarter. Three lectures or recitations and one three-hour laboratory period each week. General prerequisites must include Electrical Engineering 642 and 643, Mathematics 608.

Theory and operation of arc welding equipment. Theory of the welding arc and classification and use of electrodes. Theory and operation of gas welding equipment and other special processes.

Safety glasses must be worn in the laboratory. See footnote.

†741. Theory of Welding. Five credit hours. Winter Quarter. Four class hours and three laboratory hours each week. General prerequisites must include Welding Engineering 739 and Metallurgy 704.

The applications of basic metallurgical principles in the welding processes. The weldability of metals is studied. Laboratory work involves physical and metallographic examination of welded specimens.

Safety glasses must be worn in the laboratory. See footnote.

†742. Applications of Welding Engineering. Four credit hours. Spring Quarter. Three lectures or recitations and one three-hour laboratory period each week. General prerequisites must include Welding Engineering 741, Mechanics 713 and Mechanical Engineering 735.

The design of welded joints, structural and machine elements. Stress concentration, combined stresses and testing of welds. The training of welding operators, inspection, and safety are considered.

Safety glasses must be worn in the laboratory. See footnote.

743. Welding Design. Five credit hours. Autumn Quarter. Three lectures or recitations and two three-hour laboratory periods each week. General prerequisite must include Welding Engineering 742, Civil Engineering 733 and Mechanics 713.

The design of machine and structural elements, jigs and fixtures, and tooling for production. Cost estimation is considered. Several minor analyses will be assigned.

744. Welding Design. Five credit hours. Winter Quarter. Three lectures or recitations and two three-hour laboratory periods each week. General prerequisites must include Welding Engineering 742 and Mechanical Engineering 736.

The design of machine elements, jigs and fixtures, and tooling for production are considered. One major design project and several minor analyses will be assigned.

745. Welding Design. Five credit hours. Spring Quarter. Three lectures or recitations and two three-hour laboratory periods each week. General prerequisites must include Welding Engineering 702 and 744.

The design of products manufactured at high production levels, and the design and selection of manufacturing equipment. One major design project and several minor analyses will be assigned.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

841. Advanced Problems in Welding Engineering. Two to six credit hours

† See footnote, page 351.

in any one Quarter. The course may be repeated for a total of not more than twenty-four credit hours. Autumn, Winter, and Spring Quarters. General prerequisites must include written permission of the instructor.

This course is intended to give the student an opportunity to pursue special studies not offered in the fixed curriculum.

The student must sign up for specific sub-areas as indicated below, and he may work in more than one sub-section in any one Quarter. The student may accumulate no more than six credit hours in any sub-section, and may not accumulate more than twenty-four credit hours for the entire course.

- a. Theory of Slags and Coatings
- b. Mechanics of Welding Adhesion
- c. Weldability of Ferrous Materials
- d. Weldability of Non-ferrous Materials
- e. Control Requirements of Welding Equipment
- f. Theory of Metal Transfer
- g. Effects of Residual Stress
- i. Behavior of Weldments Under Dynamic Loading
- j. Advanced Welding Design

950. Research in Welding Engineering. Autumn, Winter, and Spring Quarters.

Research work in several phases of Welding Engineering on the advanced level. Open only to advanced graduate students who are majoring in Welding Engineering.

ZOOLOGY AND ENTOMOLOGY

Office, 101 Botany and Zoology Building

PROFESSORS D. F. MILLER, OSBORN (EMERITUS), OSBURN (EMERITUS), CUTRIGHT, DELONG, KOSTIR, LANGLOIS, J. A. MILLER, C. B. NEISWANDER, R. B. NEISWANDER, PRICE, PETERSON, RIFE, AND SLEESMAN, ASSOCIATE PROFESSORS BORROR, DAVIDSON, DUNHAM, GREEN, HAUB, KNULL, J. N. MILLER, POLIVKA, RINGS, TIDD AND VENARD, ASSISTANT PROFESSORS FISK, GOOD, HIBBS, JOHNSON, PADDOCK, PUTNAM, REESE, AND WEAVER, MR. GILTZ, MR. MYSER AND ASSISTANTS

Requirements for Advanced Degrees: In addition to the fixed requirements of the University, the Department of Zoology and Entomology requires that the candidate for the Master's degree shall have had, at the time of the comprehensive examination, fundamental training in the following subjects: organic or biological or agricultural chemistry, botany and any three of the following groups: anatomy or vertebrate zoology, invertebrate zoology, embryology, or genetics, plant or animal physiology, plant pathology or bacteriology. Additional requirements in the special field in which the degree is taken will be indicated by the adviser. The candidate for the Doctor's degree, in addition to the fixed requirements of the University and all of the groups indicated above, shall have had at the time of the comprehensive examination, a fundamental knowledge of the following subjects: college algebra and statistics, physics, ecology and geology or evolution, besides familiarity with the current literature. Additional requirements in the special field of research will be indicated by the adviser.

ZOOLOGY

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

603. Fundamental Genetics. Five credit hours. One Quarter. Autumn and Winter. Three lectures and two two-hour laboratory periods each week. General prerequisites must include elementary courses in Zoology and Botany, and at least fifteen Quarter hours of credit in any one or more of the following: chemistry, physics, and mathematics.

For all students planning to specialize in genetics (plant or animal) or in the application of genetics to their area of specialization. Lectures are devoted to a discussion of the basic experiments, principles, and concepts of theoretical and applied genetics. Laboratory work consists of breeding experiments with *Drosophila* and *Neurospora*.

605. Animal Behavior. Three or five credit hours. Autumn Quarter. Two lectures and four or six laboratory hours each week. Mr. J. A. Miller.

This course is devoted to the study of the neurological basis of animal reactions with emphasis on the mechanics of adjustment to heat, light, chemical, and mechanical stimulation.

609. Animal Microtechnic. Five credit hours. Spring Quarter. Primarily a laboratory course with discussions and assigned readings. General prerequisites must include at least three Quarters' work in chemistry and at least twenty hours in biological sciences. The class is limited to twelve students and permission of the instructor must be obtained before registering for the course. Mr. Kostir, Mr. J. N. Miller.

The theory and practice of microscopic methods, including fixing, imbedding, sectioning, mounting, and staining of animal tissues, and the effective use of modern microscopes and their accessories.

610. Animal Parasites. Five credit hours. One Quarter. Winter and Spring. Two lectures and three two-hour laboratory periods each week. Mr. J. N. Miller.

This course covers the general principles of parasitology, the morphology, life history, and classification of parasites, and their host relationships. Recommended for students preparing for medical or zoological work.

Not open to students who have credit for Zoology 504 or 619.

617. General Cytology. Five credit hours. Winter Quarter. Three lectures and two two-hour laboratory periods each week. General prerequisites must include at least three Quarters' work in chemistry and at least twenty hours in biological sciences. Permission of the instructor must be obtained before registering for the course. Mr. Kostir.

A study of the nature of protoplasm, the inner organization of living cells, and the fundamental phenomena of life.

618. The Cytological Basis of Genetics. Five credit hours. Winter Quarter. Two lectures and three two-hour laboratory periods each week. General prerequisites must include Zoology 603 and permission of the instructor. Mr. Paddock.

An opportunity to examine cells and decide for oneself whether or not the behavior of chromosomes during mitosis and meiosis is just what it ought to be if chromosomes are the hereditary particles of theoretical genetics.

620. Advanced Zoology of Vertebrates. Five credit hours. Spring Quarter. Three lectures and two two-hour laboratory periods each week. General prerequisites must include elementary courses in zoology. A course in evolution and one Quarter in comparative anatomy are also desirable. Mr. Price.

A study of the various vertebrate groups, emphasizing their origin, phylogeny, classification, life histories, habits, distribution, and economic importance. Laboratory, museum and field work. Especially recommended for students specializing in biological science.

625. Advanced Zoology of Invertebrates. The Protozoa. Five credit hours. Autumn Quarter. Three lectures and two two-hour laboratory periods each week. General prerequisites must include elementary courses in zoology. Mr. Kostir.

Zoology 625, 626, and 627 are fundamental courses designed to give the student a general knowledge of the structure, activities, life histories, and relationships of the invertebrate animals. It is not essential that these courses be taken in any particular order, and any one of the three may be elected independently of the others. Course 625 deals with the structure and activities of the protozoa, including both free-living and parasitic forms.

626. Advanced Zoology of Invertebrates. Five credit hours. Winter Quarter. Three lectures and two two-hour laboratory periods each week. General prerequisites must include elementary courses in zoology. Given in alternate years. Mr. Kostir.

A study of the structure, activities, life histories, and relationships of sponges, coelenterates, lower worms, and annelids, together with the consideration of important biological principles, illustrated by these groups. Note statement under Zoology 625.

***627. Advanced Zoology of Invertebrates.** Five credit hours. Winter Quarter. Three lectures and two two-hour laboratory periods each week. General prerequisites must include elementary courses in zoology. Given in alternate years. Mr. Kostir.

* Not given in 1954-1955.

A study of the structure, activities, life histories, and relationships of arthropods, molluscs, echinoderms, and other groups, together with the consideration of important biological principles illustrated by these. Note statement under Zoology 625.

629. Mammalogy. Three credit hours. Winter Quarter. Three two-hour lecture-laboratory periods each week. General prerequisites must include Zoology 620 or its equivalent. Mr. Good.

A study of mammalian comparative morphology, taxonomy, life histories, habits, distribution and economic importance. The world fauna is reviewed, with special emphasis upon mammals of the United States and particularly of Ohio.

630. The Interpretation of Biological Data. Five credit hours. One Quarter. Autumn and Winter. Four lectures and one two-hour laboratory period each week. General prerequisites must include a course in college algebra or equivalent and advanced standing in biological sciences. Mr. Green.

An introductory course in the application of quantitative methods to biological data. Methods for describing data and drawing inferences based upon samples. Meaning and use of statistical tests of significance, including the t-test, the chi-square test, and the analysis of variance test.

632. Comparative Embryology. Five credit hours. Autumn Quarter. Three lectures and two two-hour laboratory periods each week. General prerequisites must include advanced standing in biological science. Mr. Price.

A survey of various modes of embryonic development, illustrated with both invertebrate and vertebrate types. Emphasis is placed on fundamental aspects and processes of development. Both descriptive and experimental methods will be used in the laboratory work.

634. Biology of Birds. Three credit hours. Winter Quarter. Two lectures and one laboratory period each week. General prerequisites must include a course in ornithology or equivalent. Mr. Putnam.

This course deals with structural and physiological characters of birds, migration, reproductive behavior, territory, ecology, problems of bird population, and techniques of studying birds. The course is designed for majors in vertebrate zoology, ornithology wildlife conservation and ecology.

640. Wildlife Conservation. Five credit hours. Autumn Quarter. Three lectures and two two-hour laboratory periods each week with several Saturday field trips. General prerequisites must include twenty hours of biological sciences. Mr. Good.

An introductory course in the conservation and management of wildlife resources of the United States. The course is designed to acquaint students with the important wild animals of the United States, their value, relation to man and methods of regulating their abundance. Particular attention will be given to Ohio problems.

641. Methods and Techniques in Wildlife Management. Five credit hours. Winter Quarter. Three lectures and two two-hour laboratory periods each week. General prerequisites must include twenty hours of biological science and permission of the instructor must be obtained. Mr. Good.

A study of research and management techniques employed in the field of wildlife conservation. Consideration will be given to methods of collecting and preserving biological specimens, making food habits studies, measuring animal populations, field mapping, interpretation of animal signs in the field, control methods and other practical management techniques. This course is especially designed for majors in the field of wildlife conservation.

643-644-645. Wildlife Conservation Conference. One credit hour. Autumn, Winter, and Spring Quarters. General prerequisites must include twenty hours of biological science.

Review of current research. Reports on subjects relating to wildlife conservation by visiting technicians. Reports on special subjects assigned to students.

701. Special Problems. Two to five credit hours. Autumn, Winter, and Spring Quarters. A student may enter at the beginning of any Quarter. General prerequisites must include satisfactory preparation for individual work in the field of the chosen problem. The student may have free choice of the instructor under whom he desires to work, but the permission of the instructor must be obtained before registering for the course.

(a) Animal Behavior. Mr. D. F. Miller, Mr. J. A. Miller, Mr. J. G. Haub.

- (b) Animal Ecology. Mr. Price, Mr. Borror, Mr. Dustman.
- (c) Embryology and Vertebrate Zoology. Mr. Price, Mr. J. A. Miller.
- (d) Biometry. Mr. Green.
- (e) Genetics. Mr. Green, Mr. Paddock, Mr. Rife.
- (f) Invertebrate Zoology. Mr. Kostir.
- (g) Ornithology. Mr. Borror, Mr. Putnam, Mr. Reese.
- (h) Parasitology. Mr. J. N. Miller, Mr. Tidd, Mr. Venard.
- (i) Protozoology and Cytology. Mr. Kostir.
- (j) Teaching of Biology. Mr. Haub, Mr. D. F. Miller.
- (k) Wildlife Management. Mr. Dustman.

705. Physiological Genetics. Five credit hours. Spring Quarter. Five lecture periods each week. General prerequisites must include Zoology 603 and Agricultural Biochemistry 601 and 609 or Physiological Chemistry 601 or 611 or equivalent.

Topics discussed include: Chromosomes and genes as physical entities; gene mutation; genic control of elementary metabolic processes, of specificity, of mitosis, of growth and differentiation, and of morphological pattern; the existence and possible role of plasmagenes.

***706. Population Genetics.** Three credit hours. Winter Quarter. General prerequisites must include Zoology 603 and 630 or equivalent. Mr. Green.

A study of the principles underlying the effects of mutation, selection, migration and random drift upon the frequency of particular genes in natural living populations.

707. Human Genetics. Three credit hours. Winter Quarter. Three lecture-discussion periods each week. General prerequisites must include Zoology 603 and 630 or equivalent. Mr. Rife.

This is a study of human inheritance, with especial emphasis on the methods of research in this branch of genetics. Mathematical procedures employed in research in human genetics are intensively studied. The implications of the science of genetics for advanced students in the social and biological science are stressed.

Not open to students who have credit for Zoology 601.

***708. Quantitative Genetics.** Three credit hours. Autumn Quarter. Three lecture periods each week. General prerequisites must include Zoology 603, Zoology 630, and two Quarters of calculus, or equivalent. Mr. Green.

Design and analysis of experiments in quantitative genetics; estimation of components of variance due to genetic and non-genetic causes; heritability and interpretation of heritability estimates; selection, selection indices, and expected genetic advance under selection; effect of various systems of breeding on means and variances of quantitative characters in domestic animals and cultivated plants.

Not to be given until 1956-1957.

NOTE: TEACHING COURSES. For the Teaching Course in this department see the Department of Education, Course 683.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

These prerequisites include an adequate knowledge not only of zoology but also of related sciences. It is desirable that the student should have a reading knowledge of French and German.

840. Analysis of Modern Genetics. Two credit hours. Autumn Quarter. Two lecture periods each week. General prerequisites must include at least two of the following: Zoology 705, 706, 707 or Botany 740. Mr. Rife.

A survey of the frontiers of genetic research. This course is especially designed for graduate students who have completed their course work in both basic and specialized genetics. Its objective is to survey the whole field of genetics and to bring into focus problems of current interest, their significance, and methods of attacking them.

900. Seminar in Genetics. One credit hour. One Quarter. Autumn, Winter, Spring. Number in seminar limited to ten students who are selected from applicants by the staff. May be repeated, provided the total credit received does not exceed six credit hours. Beginning and other graduate students in genetics are invited to attend on a voluntary basis.

* Not given in 1954-1955.

950. Research in Zoology. Autumn, Winter, and Spring Quarters. Mr. Kostir, Mr. Price, Mr. D. F. Miller, Mr. Rife, Mr. Green, Mr. J. A. Miller, Mr. Tidd, Mr. Borrer, Mr. Venard, Mr. Paddock, Mr. Dustman, Mr. J. N. Miller, Mr. Haub, Mr. Reese, Mr. Putnam.

Problems in development, life history, morphology, ecology, genetics, animal behavior, parasitology, taxonomy, or other zoological or entomological subjects may be undertaken. For some of these the opportunities are particularly good in summer at the Franz Theodore Stone Institute of Hydrobiology. Students interested should send for this Institute Bulletin.

ENTOMOLOGY

FOR ADVANCED UNDERGRADUATES AND GRADUATES

600 and 700 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

640. Advanced Economic Entomology. Five credit hours. Spring Quarter. Three lectures and two two-hour laboratory periods each week. General prerequisites must include twenty hours of biological science and permission of the instructor. Courses in general and economic entomology are desirable. Mr. Davidson.

An advanced course covering the principles of insect control. Field and laboratory studies will be made of major insect control problems. New chemicals for insect control will be studied.

†650. Entomology for Biology Teachers. Five credit hours. Three lectures and two two-hour laboratory periods each week. General prerequisites must include ten hours of zoology or equivalent.

The course deals with the general characteristics of insects, their morphology, metamorphosis and control. A survey of the orders and families of insects with special emphasis on the biology and ecology of the most important families. The laboratory will consist of studies of the most important insect groups, how to make an insect collection, preparation of killing beetles, preserving insects for study, culturing insects for class use and for class demonstrations. Recommended especially for biology teachers or for students who desire a general knowledge of insects.

651. External Morphology of Insects. Five credit hours. Autumn Quarter. Two lectures and three two-hour laboratory periods each week. General prerequisites must include ten hours of zoology and ten hours of entomology. Mr. Borrer.

A study of the comparative external morphology of insects, with special emphasis on evolutionary trends and on the taxonomic applications of morphology.

652. Evolution of Insects. Three credit hours. Winter Quarter. Three lectures each week. General prerequisites must include ten hours of zoology and ten hours of entomology. Mr. Borrer.

An analysis of the mechanisms involved in evolution, with special reference to insects. The subjects treated include reproductive mechanisms, metamorphosis and life history, mechanisms of heredity, the nature and behavior of genes, factors affecting gene frequencies, the role of environmental factors in evolution, distribution, variation, speciation mechanisms, and the paleontological record of insects.

653. Principles of Insect Toxicology. Five credit hours. Winter Quarter. Three lectures and two two-hour laboratory periods each week. General prerequisites must include elementary courses in zoology and in general and economic entomology, or equivalent. A background of training in physics and chemistry is desirable. Mr. Fisk.

This course treats of the physiological action of insecticides and other toxic materials. Methods of securing, evaluating, and presenting toxicological data are stressed.

*654. Applications of Insect Toxicology. Five credit hours. Spring Quarter. Three lecture and two two-hour laboratory periods each week. This course is a continuation of Entomology 653 which must precede it. Mr. Fisk.

This course deals with the physiological action of fumigants, attractants, and repellents as well as the application of toxicology to insect control problems.

655. Insects in Relation to Disease. Three or five credit hours. One Quar-

* Not given in 1954-1955.

† Not given during the academic year, 1954-1955.

ter. Autumn and Spring. Three lectures each week. Students who register for five credit hours will have two two-hour laboratory periods each week in addition. General prerequisites must include introductory courses in zoology; also it is advisable to have had beginning courses in entomology, bacteriology, and animal parasites. Mr. Venard.

This course gives students interested in animal husbandry, bacteriology, entomology, medicine, veterinary science, and others an opportunity to become familiar with the recognition characteristics, habits, and controls of immature and adult insects, ticks, mites, and other arthropods that attack man and domestic animals. Considerable attention is paid to those species that transmit various diseases of man and animals. Especially recommended for premedical students.

658. Insect Ecology. Five credit hours. Autumn Quarter. Three lectures and two two-hour laboratory periods each week. General prerequisites must include Entomology 650 or equivalent; 651 and 652 are desirable. Mr. DeLong.

A review of the general principles of animal ecology with special reference to insects. This involves the study of climate, the relationship of temperature, humidity, precipitation, and evaporation to the biology of insects, the problems of hibernation, aestivation, and such applied problems as the effect of cropping, rotation, and cultivation upon the development of insect populations.

660. Entomological and Zoological Literature and Principles of Taxonomy. Five credit hours. Autumn Quarter. Three lectures and two two-hour laboratory periods each week. General prerequisites must include fifteen hours of courses in zoology or entomology at the 600 level or above. Mr. Borror.

A study of the principal references to zoological and entomological literature and a survey of publications, intended to familiarize the student with the past and present literature in zoology and entomology. A study of the principles and procedures involved in preparing papers for publication. A study of the principles of taxonomy, codes of nomenclature, and the various techniques used in taxonomic work. The laboratory will consist of practical work on the literature and the taxonomy of a selected group or groups of animals.

661. Insect Pollination. Two credit hours. Autumn Quarter. Two lecture-demonstrations each week. General prerequisites must include at least 10 hours of zoology or equivalent. Mr. Dunham.

A course for majors and non-majors dealing with insects of great economic importance, particularly in pollination of fruit and forage crops, in production of food by-products such as honey, in production of products used in industry, and in their relationships to man, animals, and soil fertility.

662. Household Insects. Three credit hours. Winter Quarter. Three lectures each week. General prerequisites must include a course in economic entomology or equivalent. Mr. DeLong.

A study of the characteristics, biology, and control of insects that annoy man or damage his buildings or goods therein. The course is also intended to acquaint the students with present practices and future possibilities of the pest control industry. Field trips will be made to observe the work of local pest control operators.

701. Special Problems. Two to five credit hours. Autumn, Winter, and Spring Quarters. A student may enter at the beginning of any Quarter. General prerequisites must include satisfactory preparation for individual work in the field of the chosen problem. The student may have free choice of the instructor under whom he desires to work, but the permission of the instructor must be obtained before registering for the course.

- (a) Apiculture and Insect Pollination. Mr. Dunham.
- (b) Immature Insects and Biological Control. Mr. Peterson.
- (c) Insects Causing or Transmitting Diseases of Animals. Mr. Venard, Mr. Davidson, Mr. Borror.
- (d) Insects Causing or Transmitting Diseases of Plants. Mr. DeLong, Mr. Davidson.
- (e) Insect Control. Mr. DeLong, Mr. Davidson, Mr. Fisk.
- (f) Insect Ecology. Mr. DeLong, Mr. Borror.
- (g) Insect Morphology. Mr. Borror.
- (h) Insect Physiology and Toxicology. Mr. Fisk.
- (i) Insect Taxonomy. Mr. DeLong, Mr. Davidson, Mr. Knull, Mr. Borror.
- (j) Laboratory Techniques and Rearing Methods. Mr. Peterson.
- (k) Insect Behavior. Mr. DeLong, Mr. Fisk.
- (l) Field and Experiment Station Problems. Mr. DeLong, Mr. Davidson, Mr. C. R. Neiswander, Mr. R. B. Neiswander, Mr. Cutright, Mr. Sleesman.

705. Systematic Entomology. Five credit hours. Winter Quarter. Two lectures and three two-hour laboratory periods each week. General prerequisites must include Entomology 651. Mr. Borror.

A survey of the various insect groups, with emphasis on the characters used in determining adult insects to family and beyond. Some attention is given to methods of collecting, mounting, and preparing insect material for study. All the orders are covered except the Trichoptera, Lepidoptera, Diptera, and Hymenoptera.

706. Systematic Entomology. Five credit hours. Spring Quarter. Two lectures and three two-hour laboratory periods each week. General prerequisites must include Entomology 651. Mr. Borror.

A continuation of Entomology 705, covering the Trichoptera, Lepidoptera, Diptera, and Hymenoptera.

712. Immature Insects. Three or five credit hours. One Quarter. Autumn and Spring. One lecture and two or four two-hour laboratory periods each week. General prerequisites must include Entomology 705 and 706 or equivalents. Mr. Peterson.

This course gives a student an opportunity to become familiar with the characters used in determining families, genera and species of immature stages of insects, especially larvae. The laboratory work deals primarily with the determination of larvae. Library and field work are included. A student collection of immature stages of insects determined to families is required. Topics such as external morphology of immature insects and methods of collecting, killing, preservation and preparation of material are discussed.

FOR GRADUATES

800 and 900 Courses. A statement of the general prerequisites for all courses in this group will be found immediately following the heading, "DEPARTMENTS OF INSTRUCTION," page 51.

814. Biological Control of Insect Pests. Five credit hours. Winter Quarter. Four lectures and one two-hour laboratory period each week. Open to graduate students with the consent of the instructor. Mr. Peterson.

An advanced course dealing with the biological agents which help to bring about a balance of control of insects. The topics considered are diseases of insects, vertebrate and invertebrate predators and insects parasitic on or within insects. The laboratory work consists largely of special assigned problems and library work.

816. Research Methods: Living Insects. Five credit hours. Spring Quarter. Three lectures and two two-hour laboratory periods each week. Open to graduate students with the consent of the instructor. It is advisable to have Entomology 658, 651 and 652 before taking this course. Mr. Peterson.

A course designed for the purpose of introducing students to methods and equipment employed today by research entomologists in their studies of living insects. Particular attention is paid to the equipment and methods employed in measuring environmental factors under laboratory and field conditions. Also, methods of rearing insects, methods of conducting life history studies, trapping insects, sampling and other information useful for entomologists now in or preparing to enter field research work are discussed. A portion of the laboratory work consists of special assigned problems.

†817. Internal Morphology and Development of Insects. Five credit hours. Spring Quarter. Two lectures and three two-hour laboratory periods each week. Mr. Fisk.

An advanced comprehensive course on the internal structures of insects, including function, morphology, histology, embryology, and metamorphosis. Microtechnical methods as applied to the internal anatomy of insects.

818. Advanced Course on Immature Insects. Three or five credit hours. Winter Quarter. One conference hour and two or four two-hour laboratory periods each week. General prerequisites must include Entomology 665 or its equivalent. Mr. Peterson.

This course is designed to give graduate students an opportunity to become familiar with the immature stages of special groups of insects. So far as possible determination to species in the groups selected will be made. Some of the groups available for study are among aquatic insects, larvae of mosquitoes, midges, dragon flies and others; and among terrestrial groups, larvae of noctuids, tortricids, pyralids, elaterids, cerambycids, tenthradimids and others. Library work is expected.

† Not given during the academic year, 1954-1955.

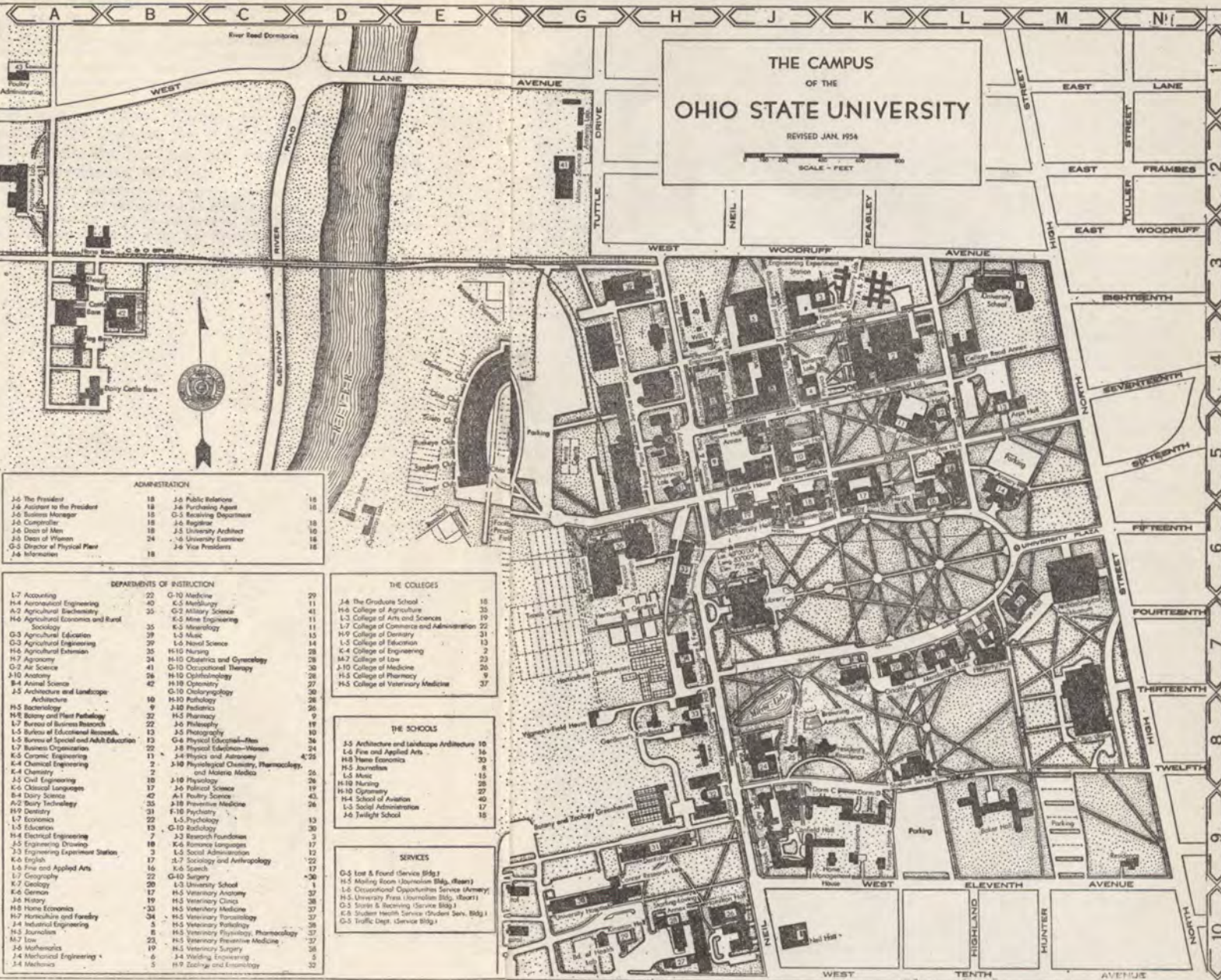
850. **Insect Physiology.** Five credit hours. Autumn Quarter. Three lectures and two two-hour laboratory periods each week. General prerequisites must include at least fifteen hours in any one or more of the following: chemistry, physics, and physiology. Mr. Fisk.

This course will be confined to quantitative aspects of insect physiology, dealing chiefly with the results of laboratory investigations on the chemistry of insect structures, body contents, and products and on digestion, blood excretion, respiration, nutrition and growth. The relations of insect physiology to the chemical control of insects will be stressed.

950. **Research in Entomology.** Autumn, Winter, and Spring Quarters. Offered at Columbus and Wooster. Mr. DeLong, Mr. D. F. Miller, Mr. Peterson, Mr. Davidson, Mr. Borror, Mr. Knull, Mr. Dunham, Mr. Venard, Mr. Cutright, Mr. R. B. Neiswander, Mr. C. R. Neiswander, Mr. Fisk.

Problems in development, life history, morphology, ecology, genetics, animal behavior, parasitology, taxonomy, or other zoological or entomological subjects may be undertaken. For some of these the opportunities are particularly good in summer at the Franz Theodore Stone Institute of Hydrobiology. Students interested should send for this Institute Bulletin.

J-4 Administration Bldg.
 A-2 Agriculture Lab.
 J-5 Alumni House
 G-2 Antenna Lab.
 M-6 Archaeological Museum
 L-6 Armory
 L-5 Arps Hall
 L-9 Baker Hall
 H-8 B. & Z. Annex
 A-4 Beef Cattle Barn
 J-4 Betatron Lab.
 H-9 Botany & Zoology Bldg.
 H-9 Botany Greenhouses
 J-5 Brown Hall
 J-5 Brown Hall Annex
 J-8 Browning Amphitheater
 H-8 Campbell Hall
 G-10 Cancer Research Lab.
 J-5 Canfield Hall
 K-3 Chemistry Lab. 7A & 7B
 L-4 College Road Annex
 J-4 Communications Lab.
 D-6 Cyclotron Lab.
 A-4 Dairy Cattle Barn
 H-9 Dentistry Bldg.
 H-4 Derby Hall
 H-4 Electrical Engineering Bldg.
 H-4 Engineering Annex A, B, and C
 J-3 Engineering Experiment Station
 K-7 Faculty Assembly
 G-4 Garage & Laundry
 H-8 Gardener's Residence
 L-7 Hagerty Hall
 J-10 Hamilton Hall
 L-6 Hayes Hall
 A-4 Hog Barn
 K-9 Home Management House
 A-2 Horse Barn
 H-7 Horticulture & Forestry Bldg.
 H-7 Horticulture Gardens
 H-7 Horticulture Greenhouses
 L-5 Hughes Hall
 J-4 Industrial Engineering Bldg.
 G-3 Ives Hall
 H-5 Journalism Bldg.
 G-10 Kinsman Hall
 J-5 Library
 K-5 Lord Hall
 J-9 Mack Hall
 J-9 McMillin Observatory
 K-4 McPherson Chemical Lab.
 L-7 Mendenhall Lab.
 G-2 Military Science Bldg.
 H-6 Natorium
 J-10 Neil Hall
 K-9 Nurses Home
 F-5 Ohio Stadium
 M-8 Ohio Union
 H-10 Optometry Bldg.
 K-7 Orton Hall
 J-9 Oxley Hall
 M-7 Page Hall
 H-5 Pharmacology & Bacteriology Bldg.
 G-6 Physical Education Bldg.
 J-4 Physics Bldg.
 B-4 Plumb Hall
 L-8 Pomeroy Hall
 A-1 Poultry Administration Bldg.
 G-5 Power Plant
 K-8 President's Residence
 D-6 Pump House
 F-10 Receiving Hospital
 H-4 Rehearsal Hall
 J-4 Research Foundation Offices Bldg.
 J-4 Research Laboratories Bldg.
 C-1 River Road Dormitories
 A-4 Robinson Lab.
 G-5 Service Bldg.
 A-3 Sheep Barn
 H-10 Sterling-Loving Annex
 L-5 Stillman Hall
 H-4 Storage
 K-8 Student Services Bldg.
 F-10 Tuberculosis Hospital
 H-4 Townsend Hall
 J-4 University Hall
 G-10 University Hospital
 L-3 University School
 H-5 U. S. Post Office
 H-5 Veterinary Clinic
 H-5 Veterinary Lab.
 J-9 Women's Dorm C
 J-9 Women's Dorm D
 G-8 Women's Field House



BULLETINS ISSUED ANNUALLY BY THE OHIO STATE UNIVERSITY

Graduate School

Graduate Center

College of Agriculture

School of Home Economics

College of Arts and Sciences

School of Journalism

School of Optometry

College of Commerce and Administration

School of Social Administration

College of Dentistry

College of Education

School of Fine and Applied Arts

School of Music

College of Engineering

School of Architecture and Landscape Architecture

College of Law

College of Medicine

School of Nursing

College of Pharmacy

College of Veterinary Medicine

Annual Report

Franz Theodore Stone Institute of Hydrobiology

Catalogue Number*

Your Guide to Ohio State

Summer Quarter

Time Schedule

University Directory*

Short Courses in Agriculture

Twilight School

The Catalogue Number and the University Directory are distributed without charge for official purposes. To individuals, the price of the Catalogue Number is 50 cents a copy and the University Directory 40 cents.

